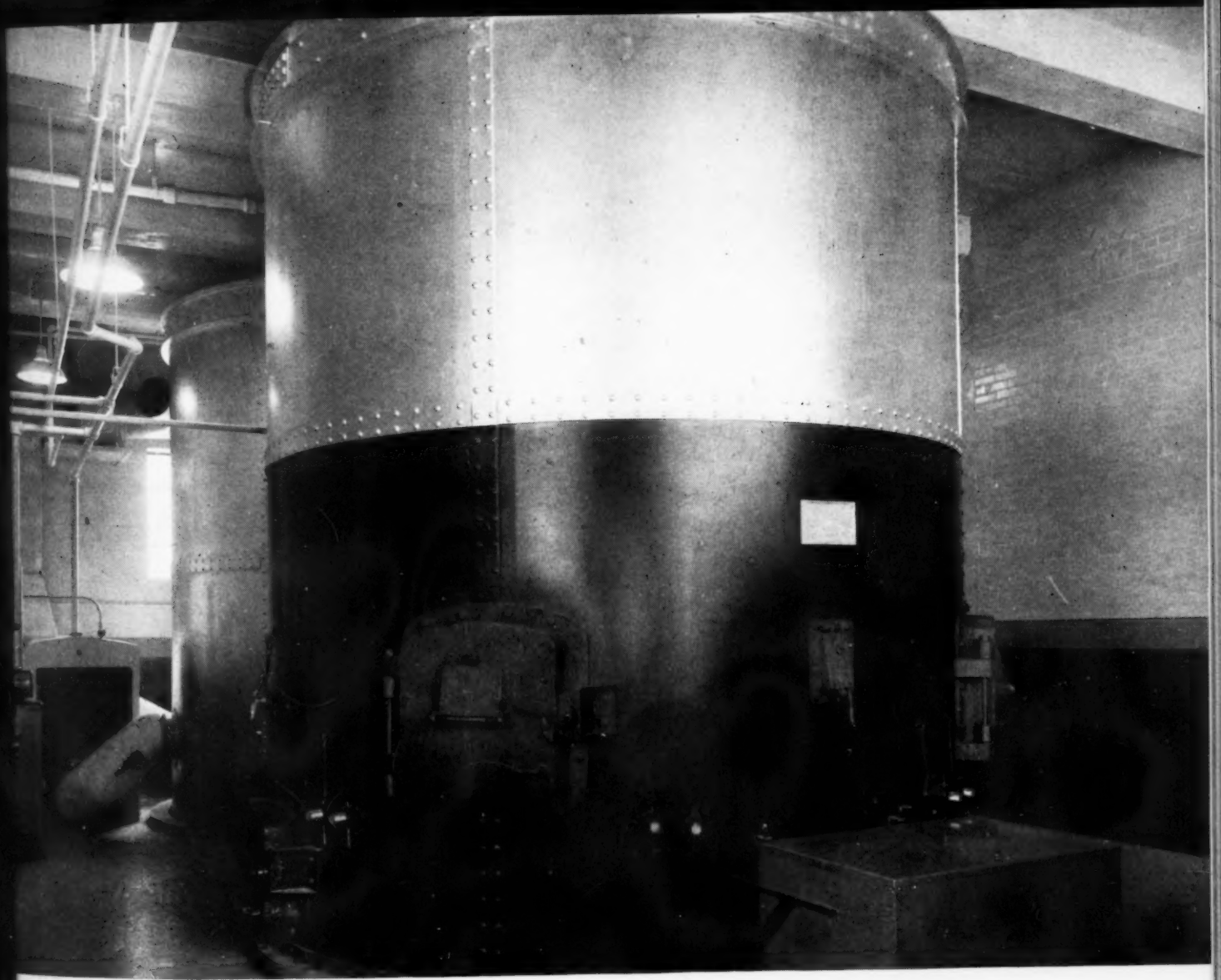
WATER & SEWAGE WORKS



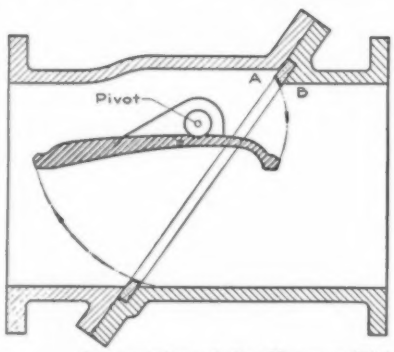
TOWN OF TONAWANDA'S 100 TON MONO-HEARTH INCINERATOR

YOU GET A

SMOOTH, EASY CLOSING

WITH

CHAPMAN TILTING DISC CHECK VALVES



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

The smooth, cushioned closing of Chapman Tilting Disc Check Valves is based on the design of the balanced hinge-pinned disc. When the valve is open, the disc rides evenly in the flow. On closing, the disc seat drops into contact with the body seat *easily* and *quietly*—cushioned by the effect of the stream against the short flap. Vibrations and destructive stresses in pipe lines are thereby reduced.

With this unique check valve, maintenance costs are cut, and head losses are reduced as much as 65% to 80% over those experienced with conventional type check valves.

Available in either iron or steel.

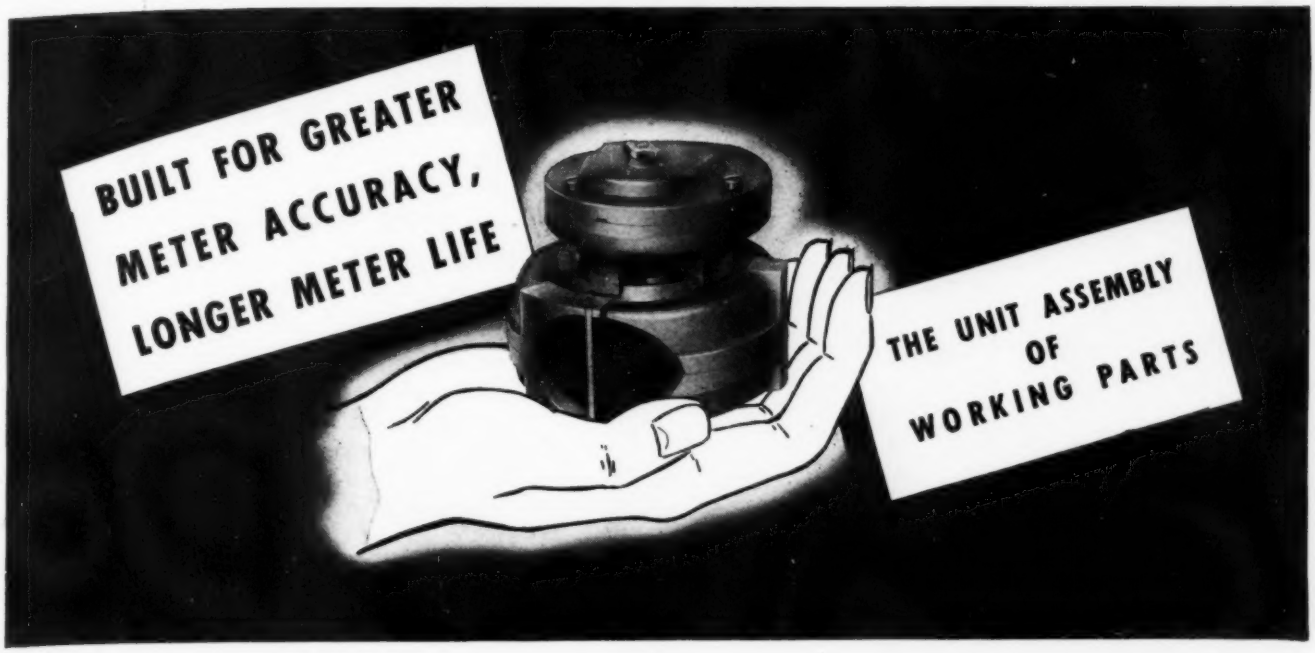
Send *today* for bulletin containing complete information.

THE CHAPMAN VALVE MANUFACTURING COMPANY

INDIAN ORCHARD, MASSACHUSETTS

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. June, 1948. Volume 95. Number 6. Published monthly by Gillette Publishing Co. at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; except *this issue*, 75 cents. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second-class matter March 4, 1948, at the post office at Mount Morris, Illinois, under the Act of March 3, 1879. Executive and Business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

Here's a FISTFUL of Precision



You're looking at the "packed-with-performance" heart of a ⅝ in. size Pittsburgh disc meter. It's the precision made, precisely fitted measuring chamber and enclosed gear train assembly.

The care with which these measurement engineered parts are made means greater revenue and lower maintenance for you. For precision in meter manufacture directly affects accuracy in measurement, durability in service.

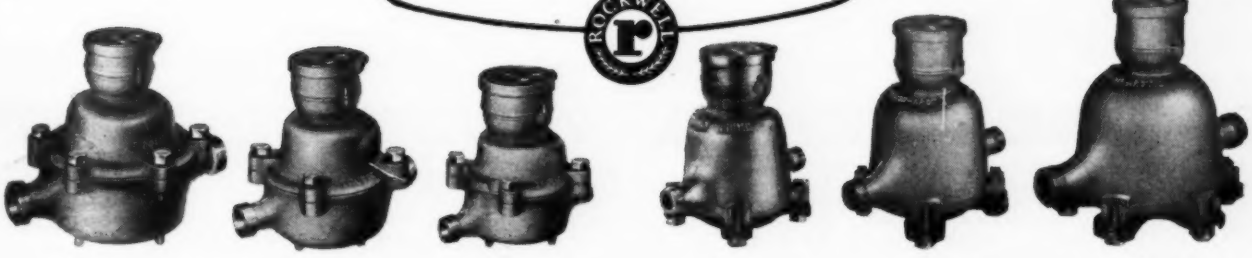
In Pittsburgh disc meters close dimensional control over machining assures perfectly mated parts, *perfectly interchangeable parts* that 10, 15 or even 20 or more years from now may be economically replaced. And the unit assembly of snap joint measuring chamber, three part disc and enclosed gear train before installation in the meter case provides repair ease and convenience that shop men like.

When you buy disc meters, think of tomorrow as well as today. Buy Pittsburgh Arctic or Tropic type—you'll find they cost less because they measure more.

PITTSBURGH EQUITABLE METER DIVISION
Rockwell Manufacturing Company
Pittsburgh 8, Pa.

Atlanta Boston Chicago Houston Kansas City Los Angeles
New York Pittsburgh San Francisco Seattle Tulsa

PITTSBURGH DISC WATER METERS



1 in. size ¾ in. size ⅝ in. size ⅝ in. size ¾ in. size 1 in. size

Another Missouri City

Above: This 250,000-gal. Horton elevated tank was recently erected at Clinton, Mo., to provide gravity water pressure in the distribution system.

. . . looks to a HORTON elevated tank for BETTER water service

Clinton adds its name to a long list of Missouri cities where Horton elevated tanks have been recently erected. The Clinton distribution system serves approximately 1400 domestic and industrial customers. Water is obtained from the South Grand River and is pumped into the system by two electrically-driven pumps of 800 and 1000 gpm capacity. There are about 30 miles of distribution mains in the system. The 7,000 residents of Clinton use an average of 650,000 gals. daily. The new 250,000-gal. Horton tank, shown at the left, is the only storage in Clinton's water system.

Adequate storage capacity in elevated tanks can provide a city with several definite benefits such as: more uniform pressures, a dependable supply of water for fire protection, a provision for pumping during off-peak periods and lower insurance rates.

Right: Map of the water distribution system at Clinton showing the location of the 250,000-gal. elevated tank.

NEW BULLETIN ON HORTON ELEVATED TANKS

Just off the press. Write for your copy of this new elevated tank bulletin on Horton ellipsoidal-bottom elevated steel tanks. It contains information on the advantages of gravity pressure in municipal water distribution systems.

CHICAGO BRIDGE & IRON COMPANY

Birmingham 1	1586 North Fiftieth Street	Cleveland 15	2262 Guildhall Bldg.	Philadelphia 3	1644-1700 Walnut Street Bldg.
Houston 2	2115 National Standard Bldg.	Los Angeles 14	1455 Wm. Fox Bldg.	Atlanta 3	2181 Healey Bldg.
Tulsa 3	1646 Hunt Bldg.	Chicago 4	2198 McCormick Bldg.	Havana	402 Abreu Bldg.
New York 6	3390—165 Broadway Bldg.	San Francisco 11	1283-22 Battery Street Bldg.	Detroit 26	1551 Lafayette Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING!

Results of Universal Metering at Naugatuck, Conn.

Were well on the plus side according to this logical follow-up article to the original published in *Water & Sewage Works*, May 1945. The author is—

WM. H. MOODY, Supt.,
Naugatuck Water Co., Naugatuck, Conn.

Chemistry of Water Treatment

Is of particular interest to water purification engineers and chemists, but this series of papers on coagulation and water softening will be read with profit by any person in the field of water supply. These fundamental articles, the second of which appears in this issue, have been prepared from lectures given before a short school by—

DR. A. P. BLACK,
Prof. of Chemistry, Univ. of Florida

Operation of Small Filtration Plants

Is the subject of a current series of short articles dealing with the operation and maintenance of small filtration plants by an author who has had considerable experience—

A. E. CLARK, Gen'l Mgr.,
Nashville (Tenn.) Suburban Util. Distr.

Our Relations Are Always With Us—

So says the writer of this open letter to Doc Symons in answer to his query, "How Are Your Relations—Public, That Is?" Done in the highly readable style of personal correspondence, this "letter" tells how the art of public relations is practiced by—

JOHN E. KLEINHENZ, Publicity,
Indianapolis (Ind.) Water Co.

Pipe Line Capacity— Its Preservation or Restoration

Constitutes a brief review of the causes of loss of delivery capacity of pipe lines with increasing age, and the high cost of such depreciation. Then follows a description of known and tested remedial measures for the correction or elimination of such losses, including measures for the restoration of capacity of existing pipe lines, reduction in pumping costs, etc. Contributed but a short time before his passing, the author is the late—

WM. S. LEA, Consulting Engineer,
Montreal, Canada

Sludge Digestion Practices—

Is the subject of a series of articles by a keen student and observer of sewage treatment practices. This series, now running, compares the various methods of sludge digestion currently practiced, with suggestions and recommendations born of observations, coupled with experience of practical plant operators. The author, who needs no introduction to our older readers, is—

LeROY Van KLEECK, San. Engr.,
Conn. State Dept. of Health, Hartford

Copper Sulfate Aids Sewer Maintenance and Sewage Treatment

And this became well known after the first article on this subject appeared in this magazine in March 1942. Since that time requests for supplemental information have been received from all parts of the world. Consequently, we have asked the original author to prepare an up-to-date review of the subject. This has been done by—

JOHN W. HOOD, Supt.,
Sewage Treatment, Ridgewood, N.J.

Water Treatment Topics

The report covering the sessions of the Water Purification Division at the Atlantic City Convention by Harry A. Faber will appear in our July issue. The delay is regretted.

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EDITORIAL OFFICE
155 E. 44th St., New York 17, N. Y.

Associate Editor
GEORGE E. SYMONS, Ph.D.

Editorial Associates
J. R. BAYLIS
A. M. RAWN
H. A. FABER

Adv. Editor
H. J. CONWAY

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L. D. SANDERS

H. P. GILLETTE, Pres.; E. S. GILLETTE, Vice Pres.; L. H. ENSLOW, Vice Pres.

New York Office.....J. M. Angell, Jr., Mgr., 155 E. 44th Street
Chicago Office.....R. T. Wilson, Rep., 22 W. Maple Street
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(Member—Audit Bureau of Circulation and Associated Business Papers.)

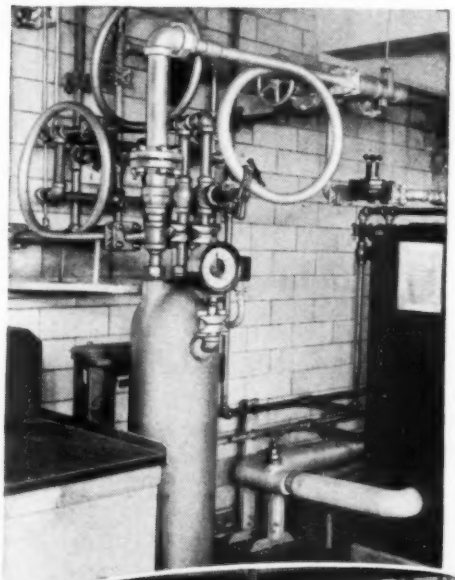
In milltown or metropolis Crane valves meet the need

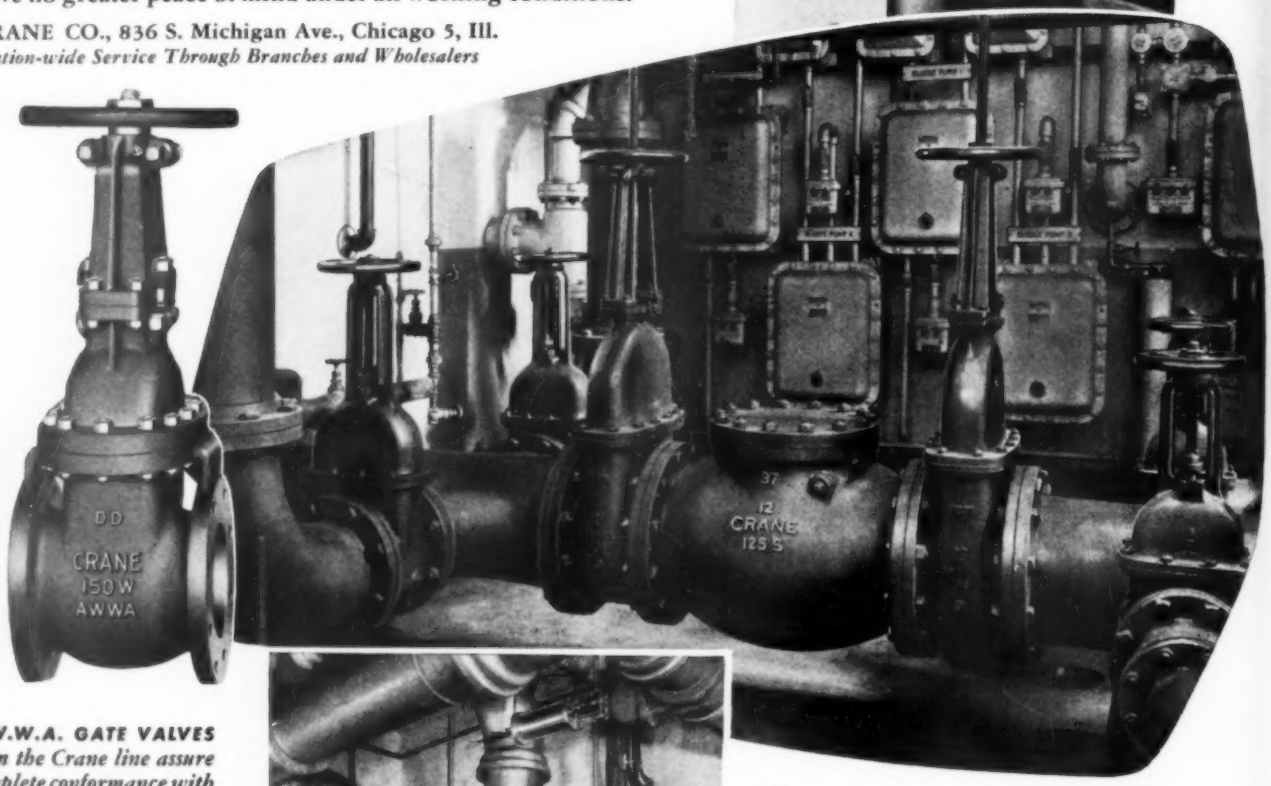
In public utility services regardless of size, what is needed more than the assurance of dependable operation? For water and sewage systems, where the nation's health is at stake, what is more necessary than dependable flow control?

In valves as in fittings, Crane Quality meets today's highest standards for water supply and sewage disposal practices. The community that builds with Crane equipment in pumping station, treatment plants, and streets, can have no greater assurance of maximum value and dependability in piping materials. The men who design and operate the systems can have no greater peace of mind under all working conditions.

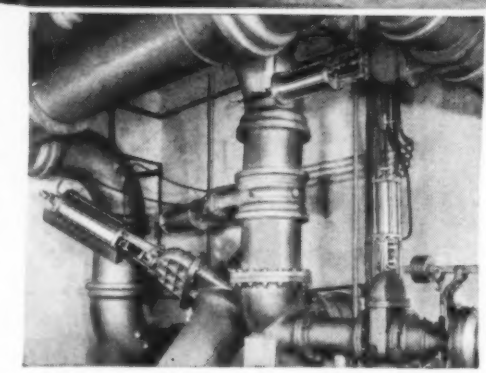
CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Nation-wide Service Through Branches and Wholesalers

CHLORINE EVAPORATOR SYSTEM *for sewage treatment—safe and dependable because piping materials are Crane Quality.*





A.W.W.A. GATE VALVES *from the Crane line assure complete conformance with latest specifications, plus unsurpassed performance for valves in this class. Shown here is pattern No. 2495, double-disc, OS&Y, with flanged ends. Made in sizes 2 to 24 in. See your Crane Catalog supplement 3A, page 126.*



SLUDGE INLET LINES *to digester in sewage plant featuring Crane iron gate and check valves, and fittings.*

CYLINDER-OPERATED *Crane iron gate valves in filter lines in large water treating plant. Crane supplies all types of remote controls for valves.*

VALVES · FITTINGS · PIPE

CRANE

PLUMBING AND HEATING

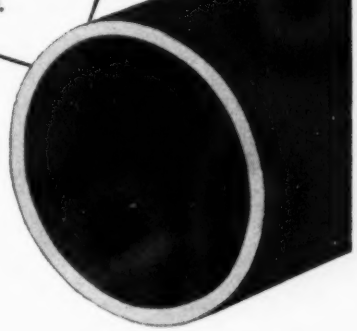
PITTSBURGH-ERIC PIPE RECONDITIONING

- PROLONGS LIFE OF SMALL WATER MAINS
- RESTORES FULL CAPACITY
- MAINTAINS HIGH VOLUME
- ELIMINATES RED WATER
- ECONOMICALLY APPLIED
- PRESERVES EQUITY OF WATER MAIN INVESTMENT

FOR WATER MAINS 3"-24" I.D.

Samples of pipe before and after cleaning and lining by Pittsburgh-Eric Process for a Southern water company.

YOU GET FULL VOLUME PLUS PIPE PROTECTION . . . when mains are cleaned and lined by PITTSBURGH-ERIC PROCESS.



Expert Pipe Cleaning Combined With Eric Process of Lining Pipe Electrolytically Makes Small Water Main Rehabilitation Programs Available At Low Cost.

- 17,100 ft.—24 in. MAIN WATER DEPARTMENT, CITY OF CHARLOTTE, N.C.
- Before Cleaning "C"—69
  After Cleaning "C"—130
  After Coating "C"—130
- G.P.D. Before Cleaning—5.6 M.G.D.
  G.P.D. After Coating—10.4 M.G.D.
  4.8 M.G.D.—INCREASE

Get the full details about a Pittsburgh-Eric Pipe Reconditioning Program for your community. Ask our nearest office TODAY!

LECTUMEN
PIPE LINING

LECTUMEN is an emulsified solution of bitumen especially prepared for use with Pittsburgh-Eric Process. Imparts a smooth, long-lasting, corrosion resistant coating to steel and C. I. pipe interiors.

Because LECTUMEN is applied electrolytically to the pipe interior, it is necessary that the main be cleaned DOWN TO THE METAL before the coating operation is accomplished. Pittsburgh-Eric specifications set a higher standard of CLEAN-NESS than is ordinarily required. Fullest capacity is thus restored.

PITTSBURGH PIPE CLEANER COMPANY

133 Dahlem St., Pittsburgh 6, Pa.

PHILADELPHIA · BALTIMORE · WASHINGTON · NEW YORK · BUFFALO · CHICAGO · CINCINNATI · ST. LOUIS · DETROIT · BOSTON

"Gentlemen, you still have a right to be from Missouri!"

SANITATION is your business, gentlemen. The cleanliness and health of the community is your department.

That's why—when we first introduced the Disposall* method of garbage elimination—you had a right to be "from Missouri," to say "Show me!"

You agreed in principle that here was a great, new step forward—leading to the end of the health menace that is garbage. But you wanted evidence that the General Electric Disposall was practical—that there would be no danger of sewage stoppages, etc.

That we have presented such evidence is shown by the

fact that farsighted sanitation experts—officials of the largest cities and the smallest towns—have accepted the Disposall method. In more than 300 communities, these responsible authorities have witnessed the installation of Disposalls in thousands of homes. In many instances, they have revised sanitary codes to permit the installation and use of Disposalls in the home.

Today—with many new food-waste shredders bidding for acceptance—all sanitation officials should once more make use of their right to be "from Missouri." They should question. Examine. Specify.

And they should remember that any method of food-waste disposal goes beyond the shredding mechanism. It is a process that extends from kitchen sink to treatment plant—and it should work to perfection every inch of the way. As with the General Electric Disposall, there should be every insurance against line clogging, odors, operational hazards.

Believing that it may be of assistance to you in judging the qualifications of *all* food-waste shredders, General Electric has ripped a page from its own history in the development and perfection of the Disposall. These are the strictest of specifications—self-imposed by a pioneer manufacturer after many years of testing and experimentation with the problem of garbage elimination.

We sincerely hope that the specifications appearing below will be of value to you in guarding the health, convenience, and cleanliness of your community.

GENERAL ELECTRIC'S SPECIFICATIONS FOR ITS FOOD-WASTE SHREDDER—THE DISPOSALL

1. The food-waste shredder should be automatically controlled by a device which permits the grinder to operate only in the presence of *cold* water flowing into the grinder and through the sink drain line at a prescribed flow rate of 1.5 to 2.5 gpm. This device should operate in such a manner as to congeal and aerate the solid and liquid greases *within* the shredding unit.

2. The food-waste shredder should discharge shredded matter at a reasonably uniform rate, in fluid form, which would flow readily through an approved trap, drain line, or soil line, in a manner which would prevent clogging or stoppage of drain line.

3. The food-waste shredder should shred food waste to a uniform size to meet the following requirements: 100 per cent shall pass a ½-inch screen. At least 90 per cent shall pass a ¼-inch screen. Not more than 5 per cent shall pass a No. 40 sieve. Screens should be the United States standard, and weight should be taken on a dry basis.

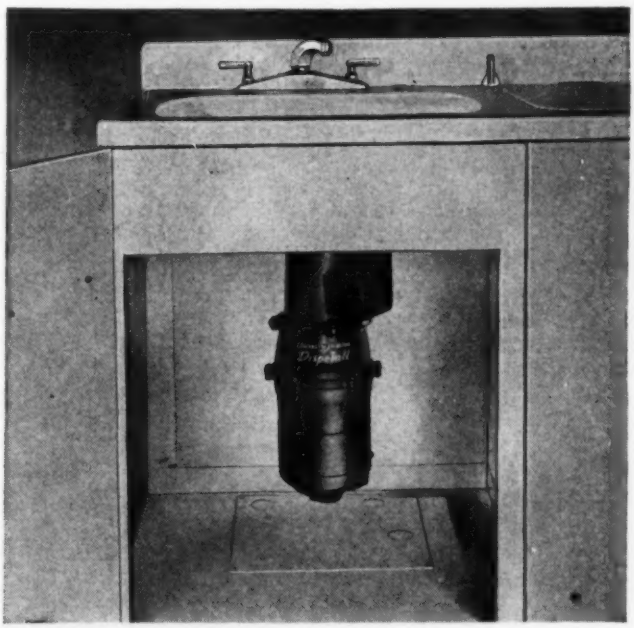
4. The food-waste shredder should be self-scouring, with no fouling surfaces to cause objectionable odors.

5. The food-waste shredder should be free from electrical or mechanical hazards. The shredding compartment should be inaccessible during operation.

6. The food-waste shredder should be permanently connected to the drain, and should be free from any cross-connection, in accordance with the local plumbing code.

• • •

For further information about the Disposall method—its economies, as well as its efficiency — simply write to Department WSW 486, General Electric Company, Bridgeport 2, Connecticut.



The General Electric Disposall is easily installed in almost any sink. Here it is shown installed in our Electric Sink. Food waste is scraped into drain opening, and safety cover is placed in position. Cold-water tap is then turned on, starting the Disposall operation. Food waste is shredded and flushed away automatically.

Disposall

*General Electric's registered trade-mark for its food-waste disposal appliance.

CONVERTS FOOD WASTE TO SEWAGE—ELIMINATES "GARBAGE"

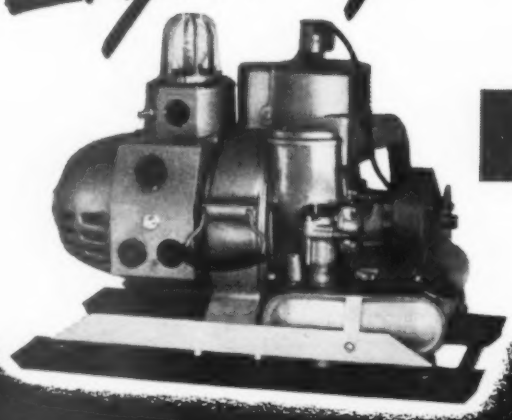
GENERAL ELECTRIC

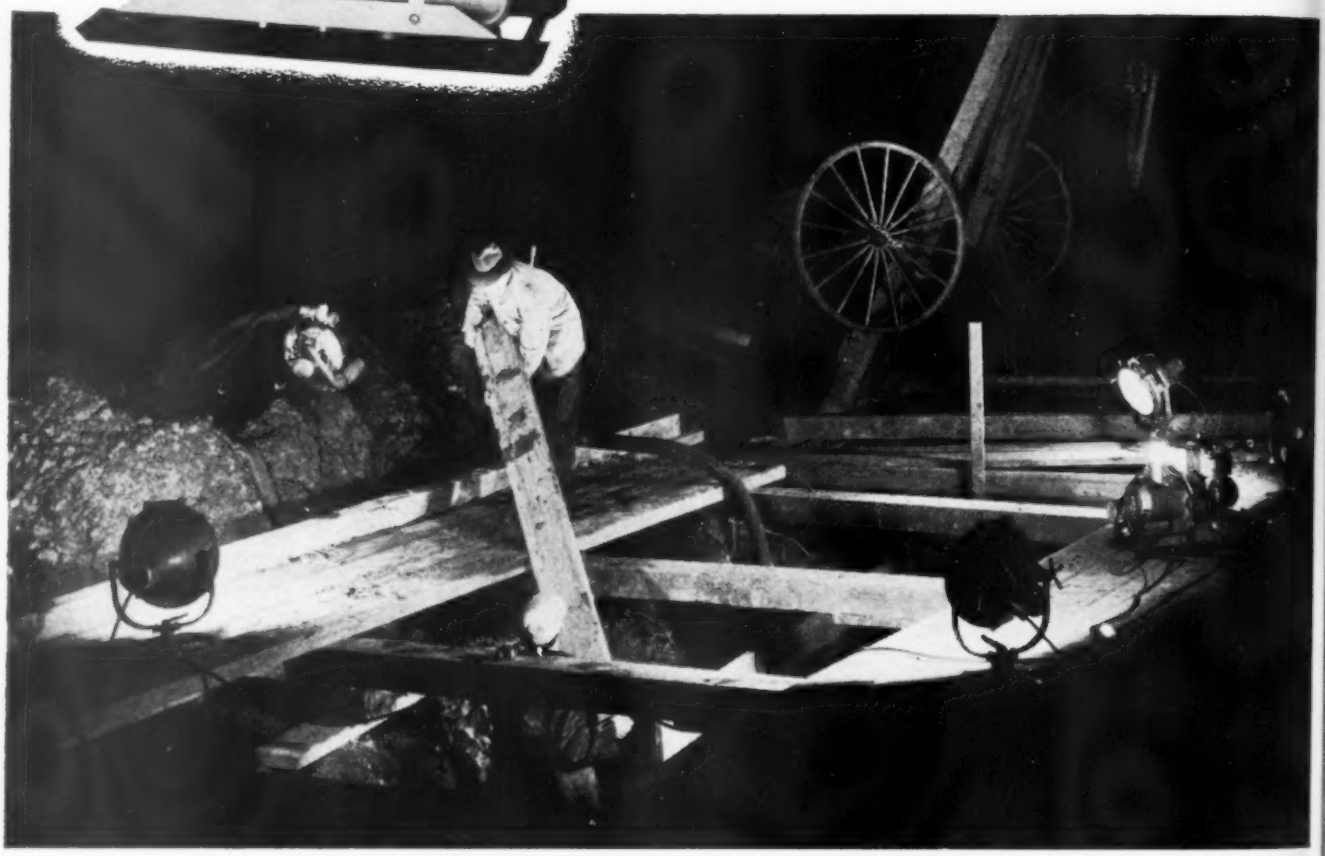
Light up and Speed up

Your Work with a

HOMELITE

Carryable Generator





It goes any place. It works any time. There in a nutshell are the prime reasons for having a Homelite Carryable Gasoline-Engine-Driven Generator handy.

It goes any place. You can pick it up and carry it. You can get it on the job quickly and without trouble. You can set it up for action *in any location.*

It works any time. It's a twenty-four hour work-saver. You use it at night for floodlights. You use it day and night for operating time-saving electric tools. You have it going any and every time you want work done faster and at lower cost.

See for yourself what it means, in terms of money and time saved, to light up and speed up your work with a Homelite Carryable Generator. Write today for a free on-the-job demonstration.

HOMELITE

Corporation

706 RIVERDALE AVENUE, PORT CHESTER, NEW YORK

Manufacturers of Homelite Carryable Pumps Generators • Blowers • Chain Saws

Glauber Ground Key Stops always operate "SLICK AS A WHISTLE"

K-1034—right—Inverted Key Curb Stop with loose tee handle. Round way, inside iron pipe threads.

K-1136—right—Corporation Stop with hexagon on inlet. Iron pipe threads both ends same size. Plain bore.

K-1148—left—Hand Wiped Joint Lead Gooseneck, complete with corporation stop, solder nipple with outside iron pipe thread.

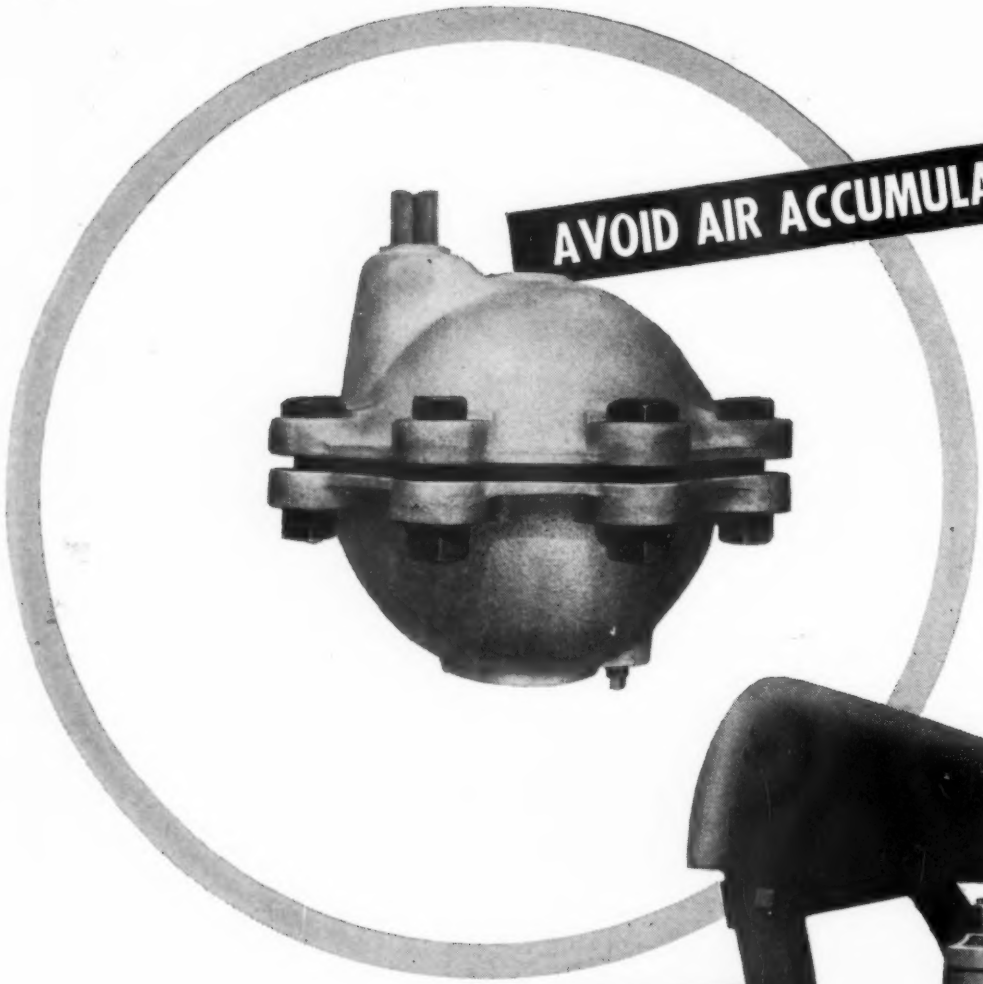
K-1420—above—Inverted Key Curb Stop with loose tee handle. Round way, for copper service pipe both ends.

Remember how easy it was to operate that willow whistle Pop or Grandad made when you were a youngster... Glauber ground key curb and corporation stops operate just as slick, even after years of underground service. Their record of performance since 1890 will now be even greater due to improved precision equipment. For both new installations and replacement insure a better job with less service maintenance by always specifying Glauber Red Brass ground key work. Standard and special code types are available in quantities to meet your requirements. Write today for quotations and a copy of our latest catalog.

THE GLAUBER BRASS MFG. CO., KINSMAN, OHIO

Division of H. B. SALTER MFG. CO., Marysville, Ohio

Glauber



AVOID AIR ACCUMULATIONS IN PIPES!

STOP PIPE COLLAPSE!

Simplex Air Release Valves automatically vent air that accumulates at high points in pipe lines and reduces their carrying capacity. Simplex Air Release Valves are simple and rugged in construction . . . will open against high internal pressure . . . and are extremely dependable.

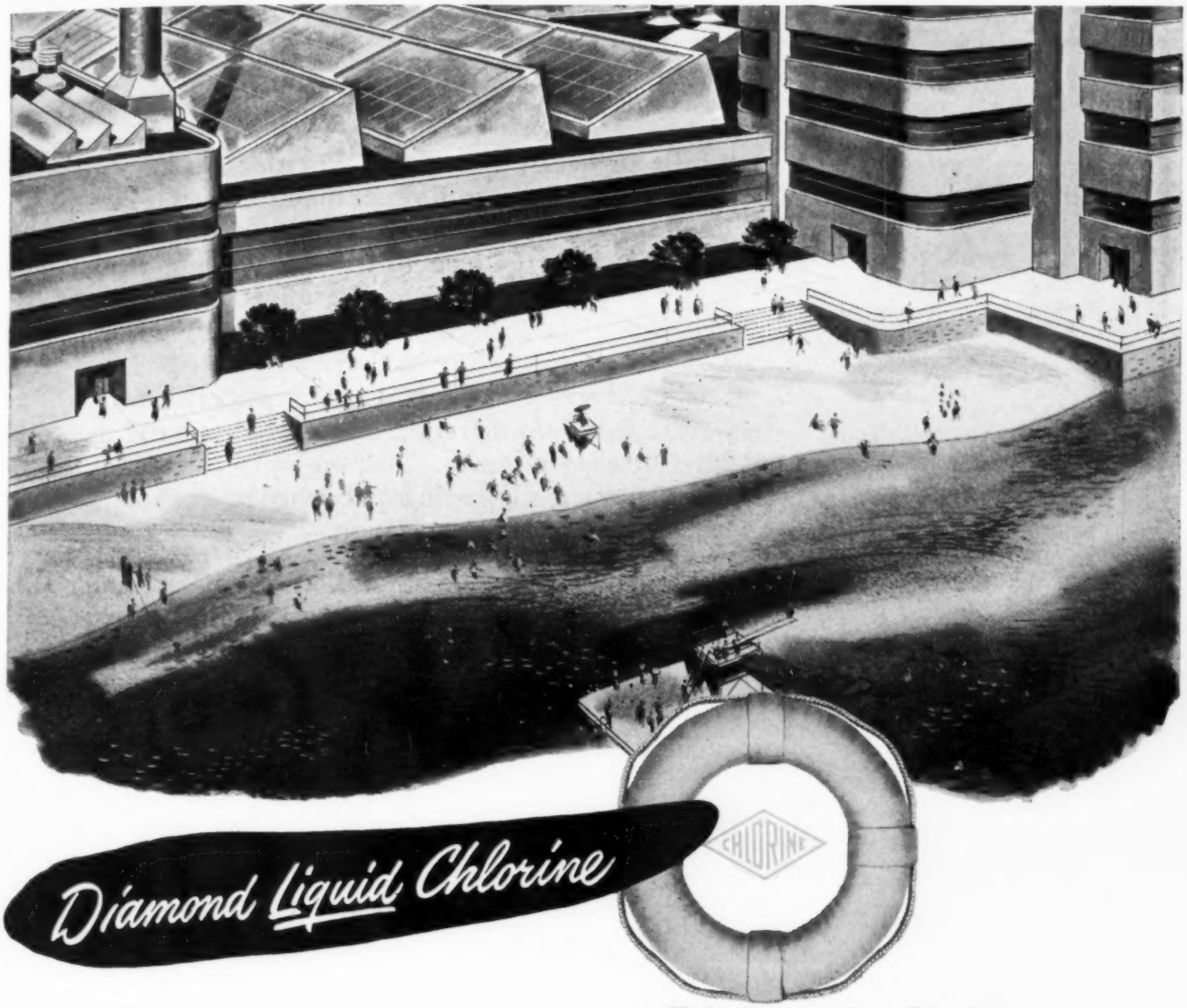
Simplex Air Inlet Valves permit the expulsion of air when lines are being filled, and admit air in large quantities should a break in the line occur. Damage to thin walled pipes caused by release of water and the formation of vacuums at higher points is prevented by the use of Simplex Air Inlet (vacuum breaking) Valves.

For full information and bulletins, write the Simplex Valve & Meter Company, 6743 Upland Street, Philadelphia 42, Pa.

SIMPLEX

VALVE AND METER COMPANY

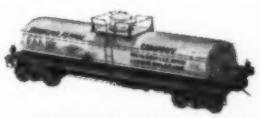
An Employees' Bathing Beach along the River beside your Plant?



Diamond Liquid Chlorine

will help make this New Employees' Activity Possible for your Company

Taking a dip in the cool, refreshing water of the river or stream along side your plant or community, is a definite possibility as the work of federal, state and local committees progresses, toward the elimination of stream pollution. Domestic sewage and industrial waste treatment will be improved through the use of Diamond Liquid Chlorine.



SHIPPED IN TANK CARS

MULTI-UNIT CARS OR

CYLINDERS AS REQUIRED

THE SAGA OF 50 MILLION

In the 128 years since 1817, 25 cities had laid 50 million feet of cast iron water mains in sizes 6-inch and up. What had happened to those mains and to other facilities? A committee representing three water works organizations determined to find out. For these 25 cities, large and small, stretching from Canada to Florida, provided a representative cross-section of water service conditions generally. Facts developed could therefore be accepted as valid by all water works men. The survey was recently completed and the findings published by the American Water Works Association.

What happened to the 50 million feet of cast iron pipe? The saga is told by the chart. It shows that, of all the cast iron water mains ever laid in the 25 cities since 1817, in sizes 6-inch and up, *96% are still in service.* This statement is based on facts secured *by* pipe users, *from* users, *for* users!

The cast iron pressure pipe industry, in spite of raw material shortages, achieved in 1947 one of the biggest production years in footage in the history of the industry, and has recently installed additional footage capacity.

Mr. Q. Check says:
Collect and sell your scrap *NOW*

All statements and percentages regarding service records of cast iron mains set forth in this advertisement are based on published reports of a survey directed by a Joint Committee representing the American Water Works Association, New England Water Works Association, and the Institute of Water Supply Utilities. The findings, as they apply to cast iron pipe, have been reprinted by permission in our brochure "Survival and Retirement Experience with Cast Iron Water Mains." If you have not received a copy, write to Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Avenue, Chicago 3, Illinois.

CAST Q IRON

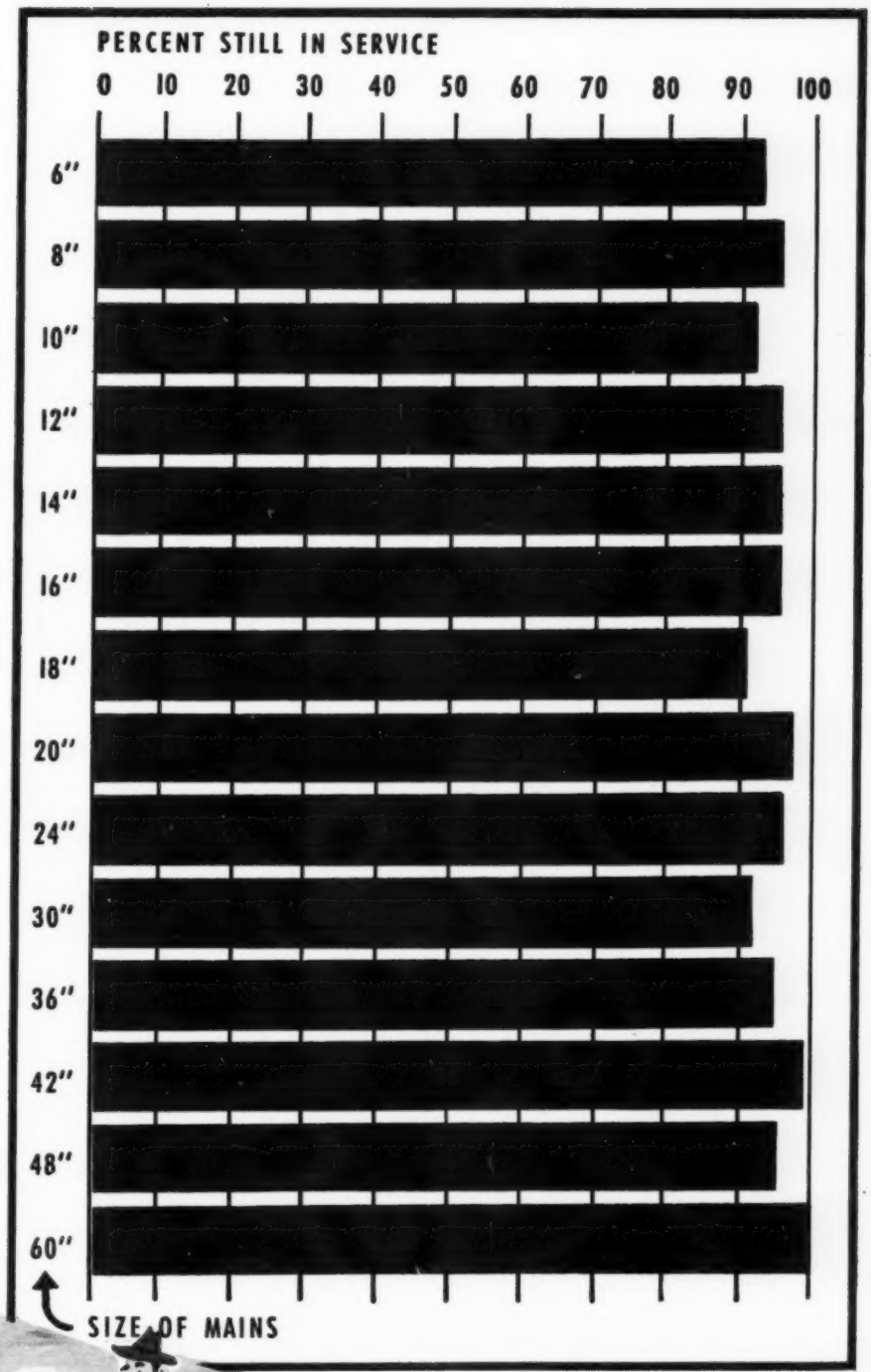
CAST IRON PIPE

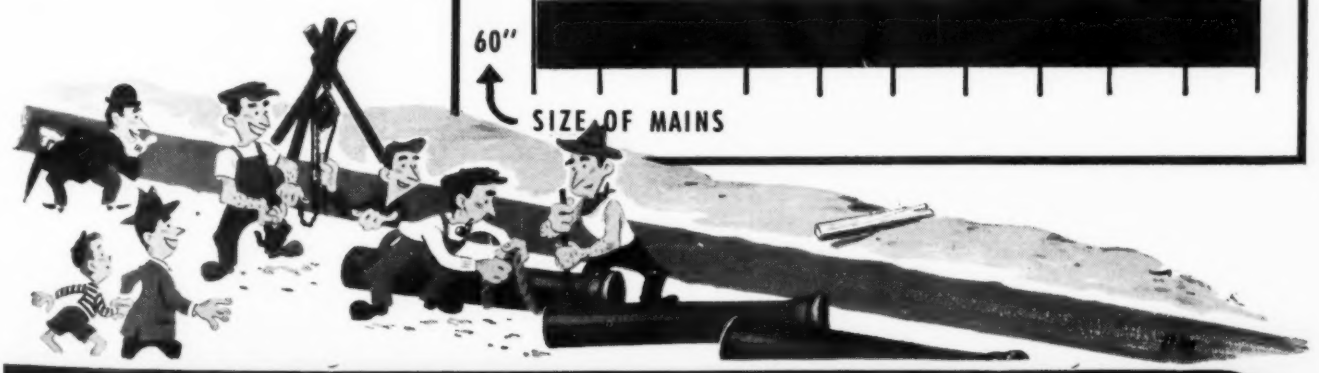
FEET OF CAST IRON PIPE

96% OF ALL CAST IRON WATER MAINS* LAID IN THESE 25 CITIES OVER A PERIOD OF 128 YEARS ARE STILL IN SERVICE

Alexandria, Virginia
Babylon, New York
Clinton, Iowa
Clyde, New York
Denver, Colorado
Des Moines, Iowa
Detroit, Michigan
Huntington, West Virginia
Jamaica, New York
Merrick, New York
Norwich, New York
Ottawa, Ontario
Philadelphia, Pennsylvania
Portland, Maine
Rochester (Suburban), N. Y.
St. Mary's, Pennsylvania
St. Paul, Minnesota
Sag Harbor, New York
Scranton, Pennsylvania
Springfield, Massachusetts
Summit, New Jersey
Syracuse (Suburban), N. Y.
Utica, New York
West Palm Beach, Florida
Winnipeg, Manitoba

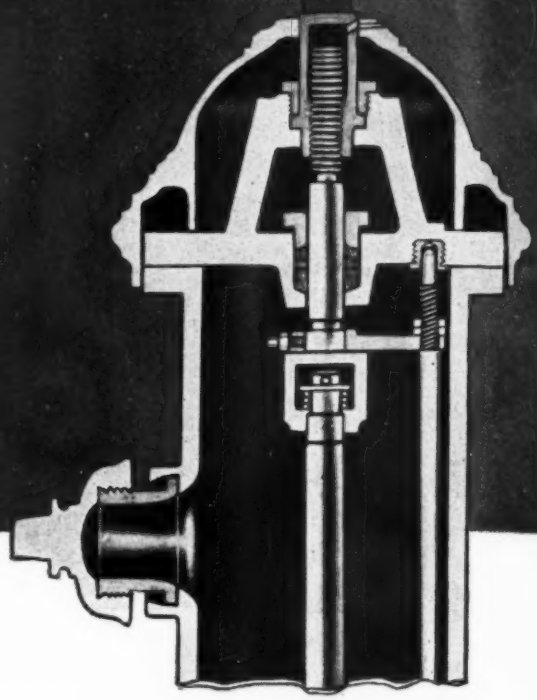
*Sizes from 6 to 60 inches.





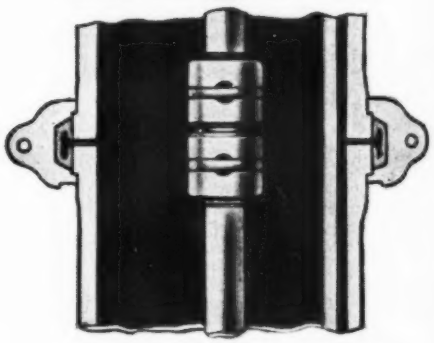
SERVES FOR CENTURIES

THE SMITH *Protectop* HYDRANT



Collision damage quickly repaired

Breakage is confined to easily replaceable frangible stem and stand pipe couplings.



Frost can't heave the hydrant

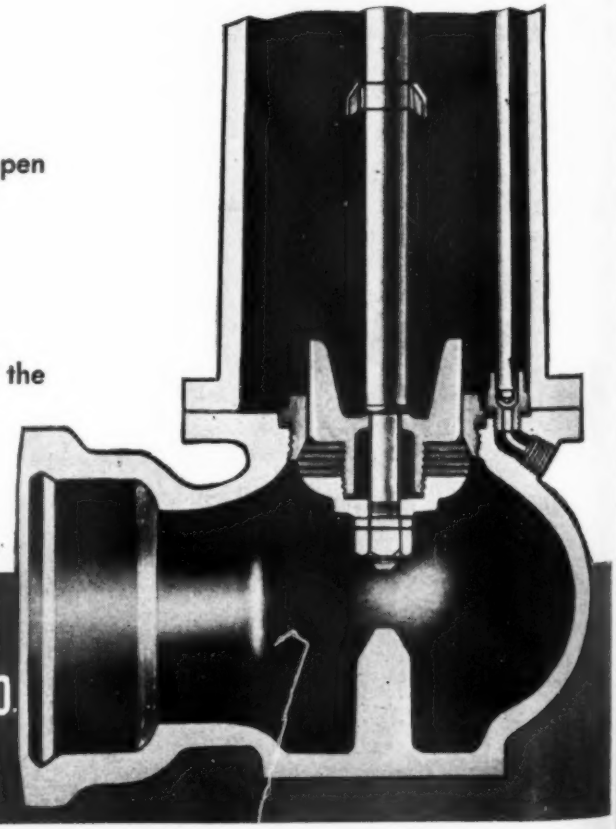
The taper on the stand pipe breaks the grip as the frozen ground rises.

Drainage under pressure can't undermine the hydrant

The Smith positive action drain valve is never open unless the main valve is *completely* closed.

Maximum delivery

The stand pipe area is more than twice that of the hydrant valve area.



27

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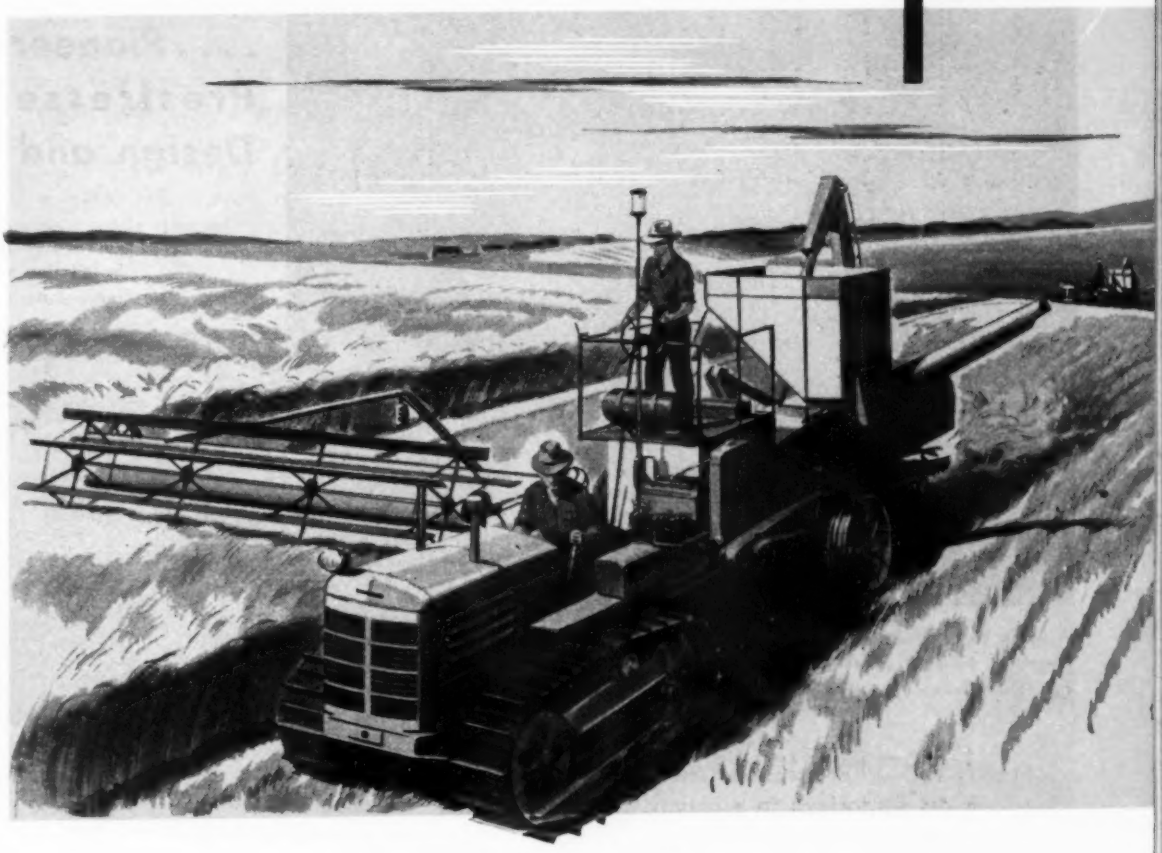

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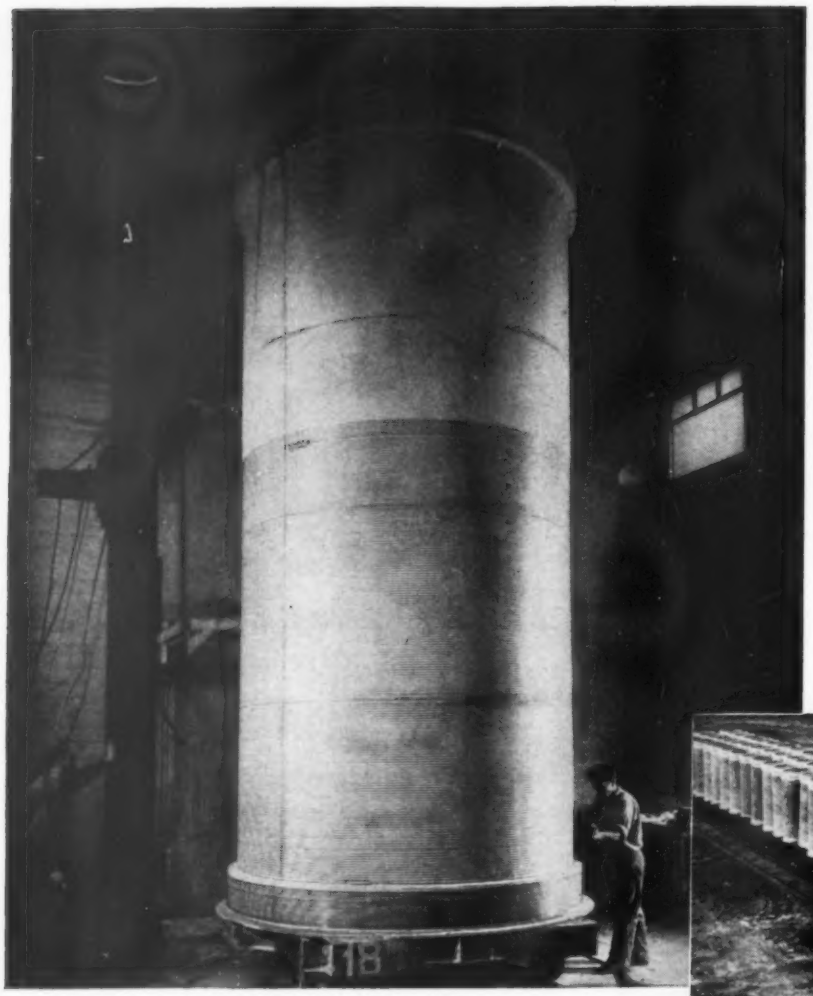
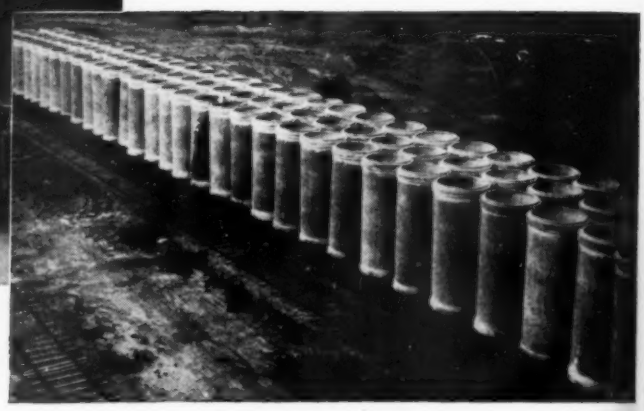


Winding high tensile strength wire on an 18 ft. length of 84 inch diameter Preload Prestressed Concrete Pressure Pipe at Montreal, Canada.

PRESTRESSED CONCRETE PRESSURE PIPE *by* PRELOAD

....Pioneers in Prestressed Concrete Design and Construction

Finished lengths of pipe stored ready for installation in the new Montreal-St. Lawrence water supply intake.



Specify Preload Prestressed Pressure Pipe to attain the following advantages in economy, performance and capital investment value:—

1. **Thinner wall and corresponding lighter weight.**
2. **High internal bursting strength.**
3. **Great external loading strength.**
4. **Substantial economies due to lower first cost; long-term freedom from corrosion and corresponding sustained flow capacity; low maintenance cost; immediate availability of materials.**

Preload is now applying the well known advantages of prestressed concrete construction to pressure pipe of 20 inch diameter and larger, and also is using the Preload-Rocla Internal Expansion Method to make pressurized, prestressed concrete pipe in diameters of 6 inches and larger.

The illustrations show Preload Prestressed Pressure Pipe for the Montreal Municipal Water Supply System's new intake from the St. Lawrence River—a pipeline approximately 10,000 feet in length designed to eliminate the less desirable Ottawa River water.

Each pipe section of 84 inch diameter is 18 feet long and weighs 18 tons. Utilizing the well known Preload Wire Prestressing System the units are built on the site, a procedure which insures no delays, no transportation problems.

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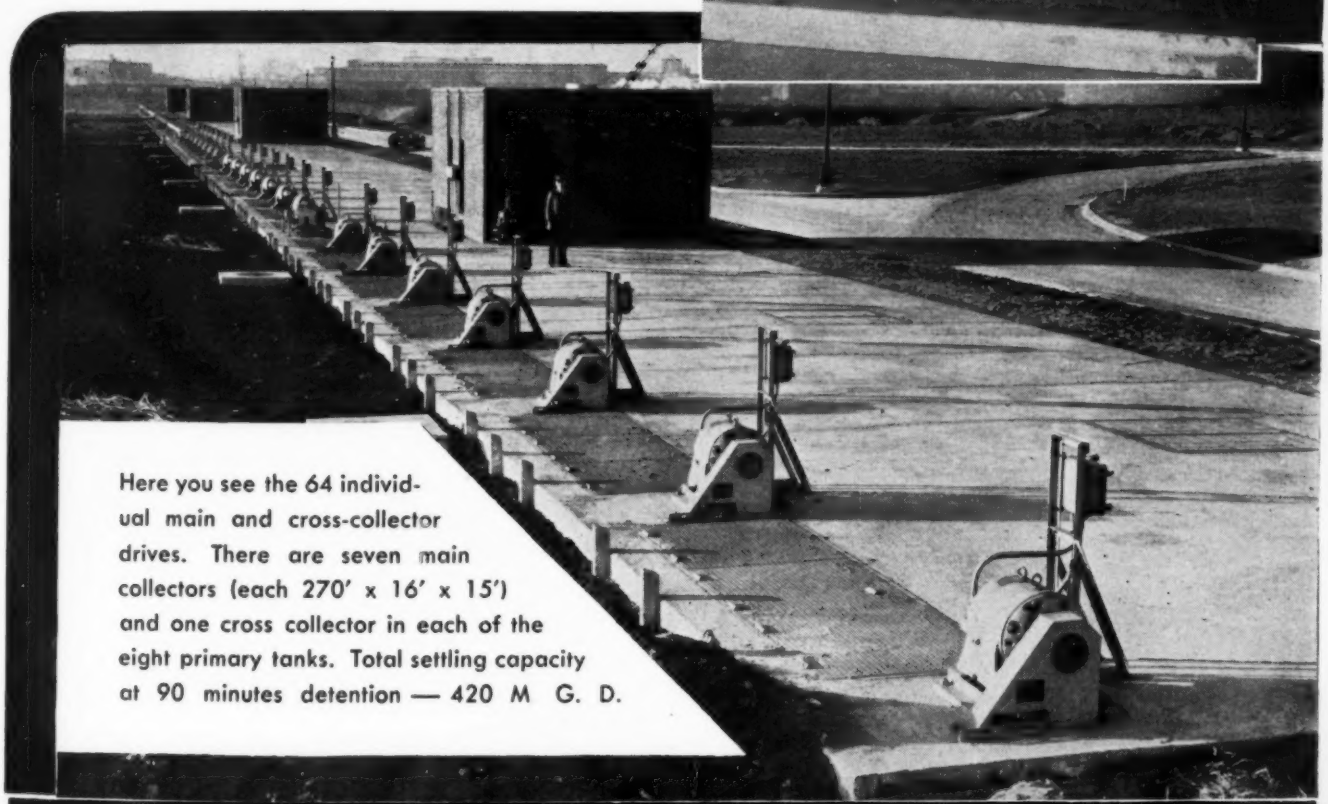
Right — view through one of the 270-foot main sludge collectors. There are fifty-six main collectors in the primary settling tanks. Space does not permit showing the six bar screens and the twelve grit collectors, designed for maximum flow of 900 M. G. D.



Here you see the 64 individual main and cross-collector drives. There are seven main collectors (each 270' x 16' x 15') and one cross collector in each of the eight primary tanks. Total settling capacity at 90 minutes detention — 420 M G. D.

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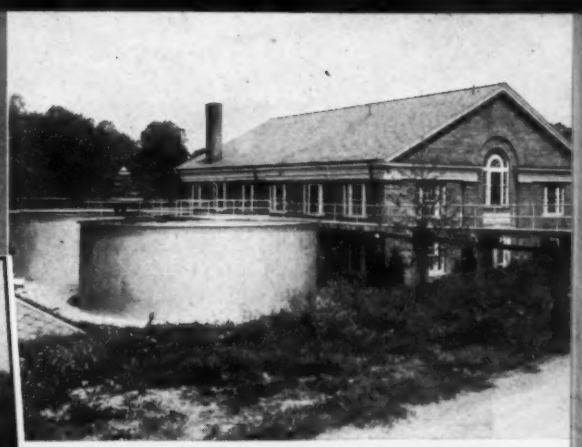

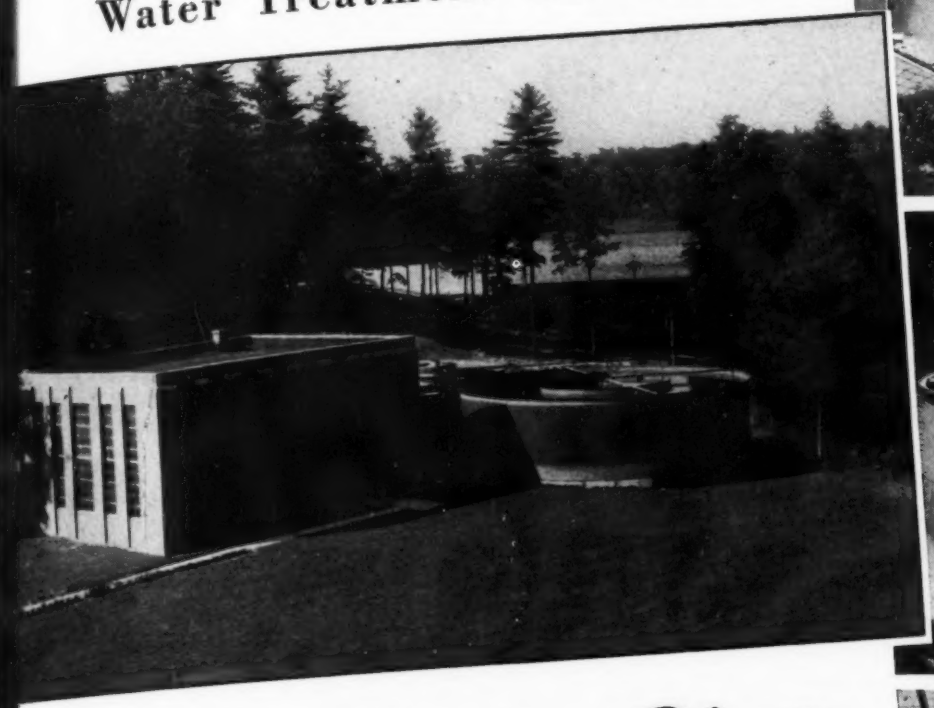

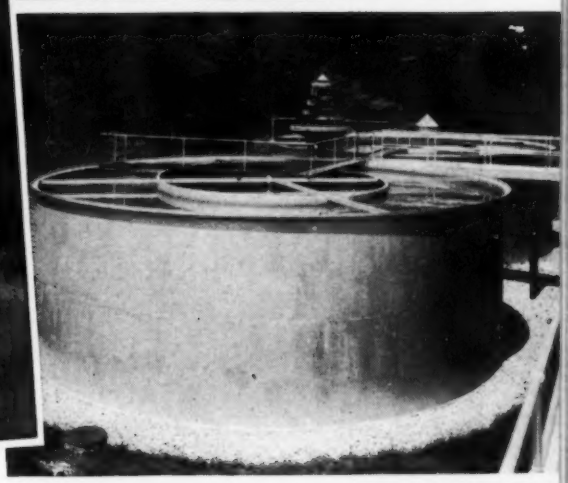

Steel Filtration Plants
by
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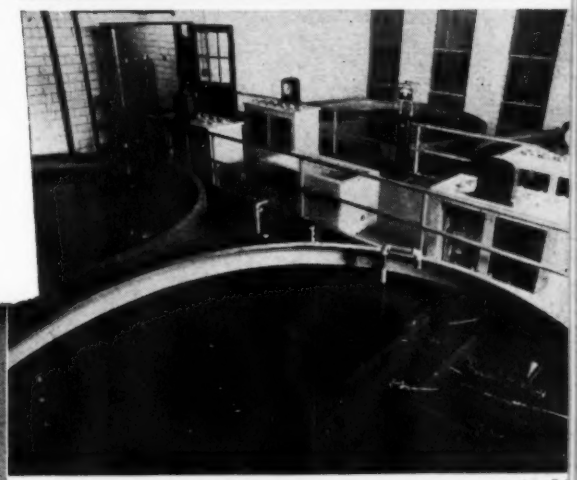

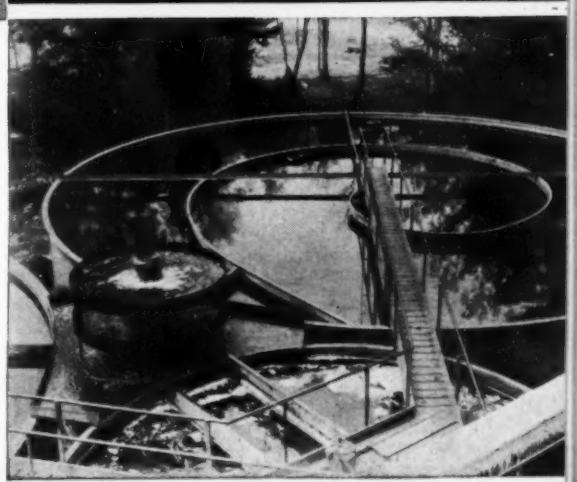

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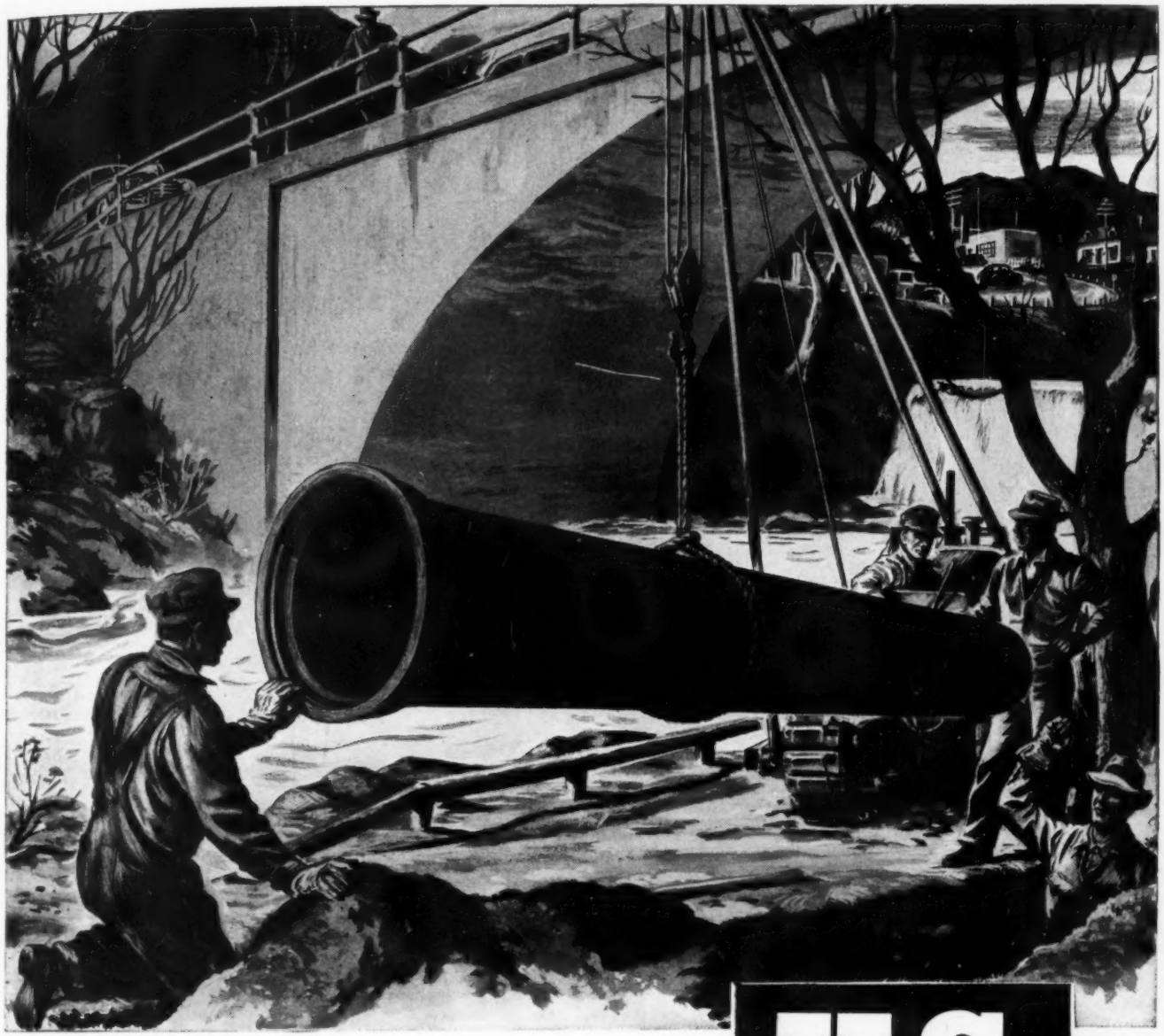

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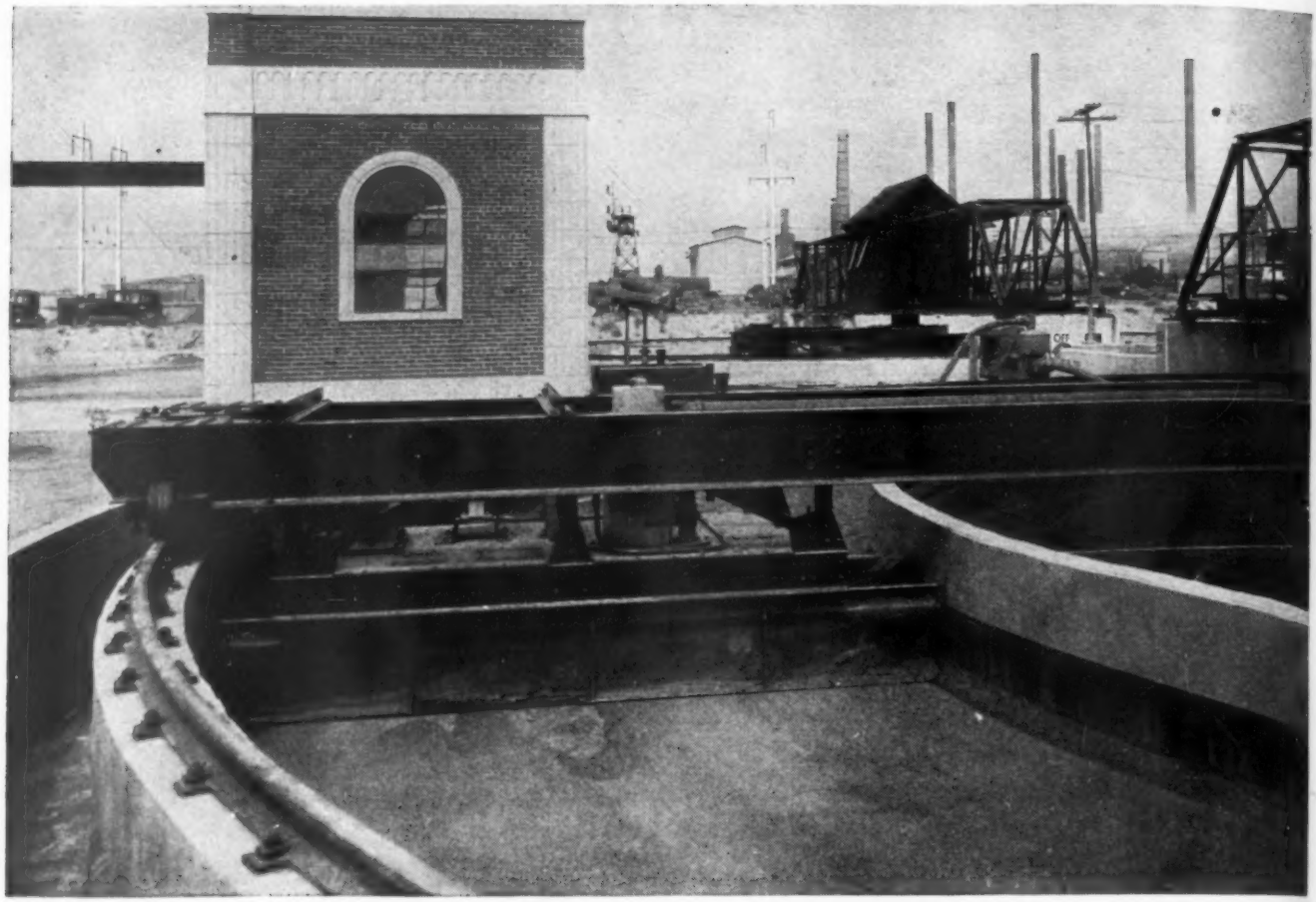

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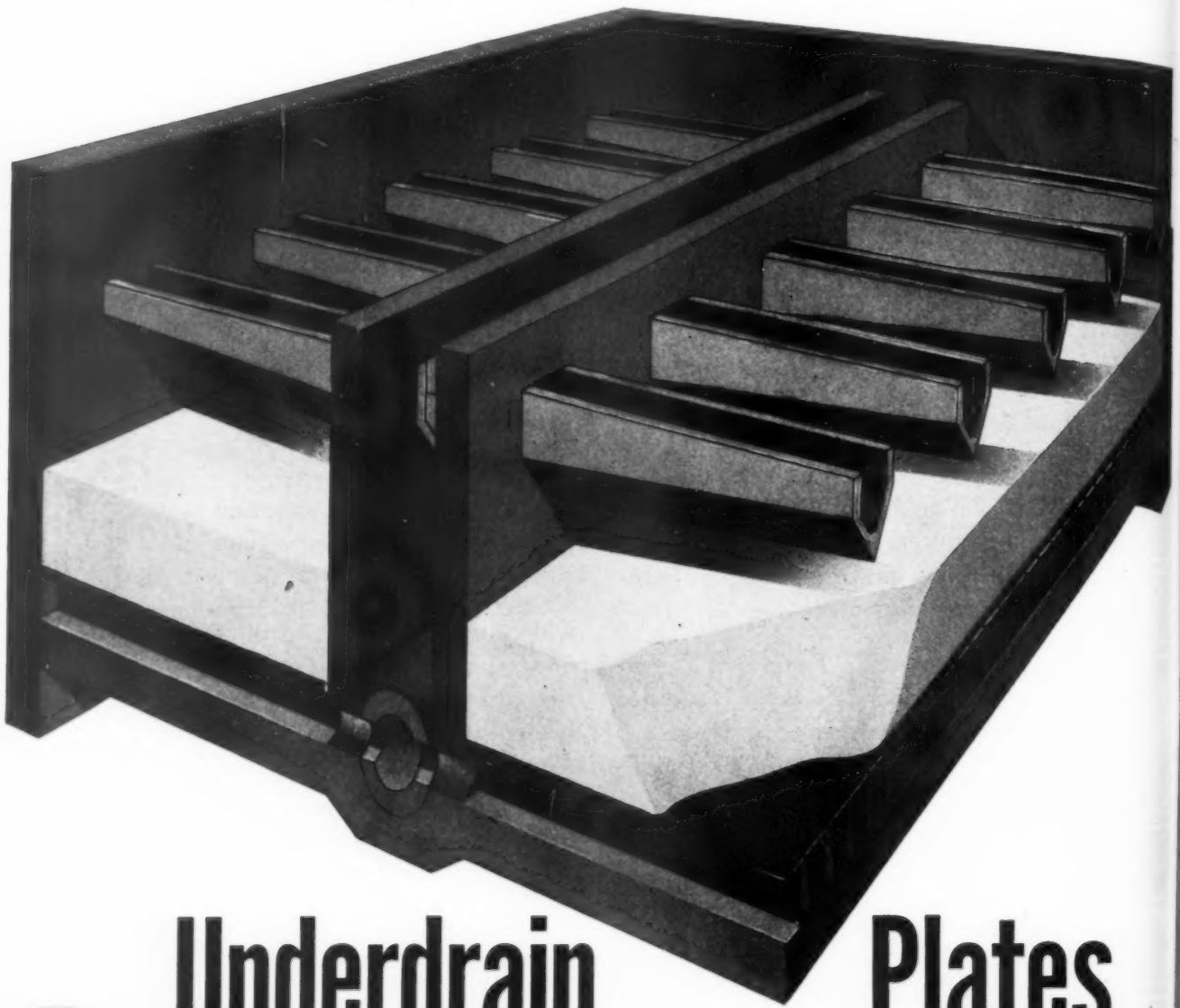

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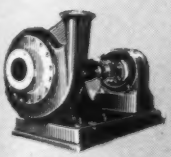

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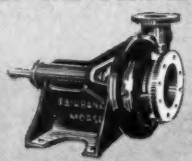

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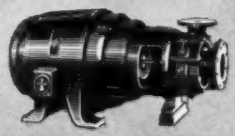

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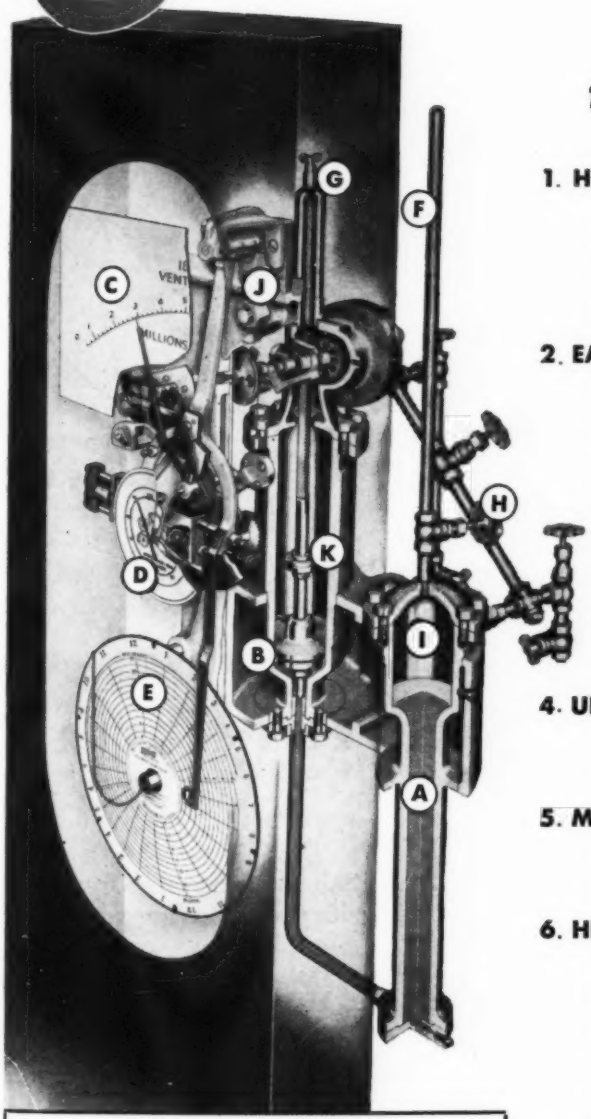
8 GOOD REASONS!

Why Builders Type M Meter Instrument is THE BEST BUY for Water and Sewage Works



1. HEAVY-DUTY "POWER PLANT":
Large wells containing 35 lbs. of mercury (A) and a solid float of 10¼ sq. in. area having a vertical travel of 4½" (B) provide the reserve *power* necessary for years of super-sensitive, accurate, and trouble-free operation.

2. EASY-TO-READ DIALS:
Separate Indicator 10" long, uniformly-spaced, direct-reading graduations (C); direct-reading Totalizer: 6 dials, largest dial 3½" dia. with fast-moving hand for precision reading (D); uniformly-spaced, direct-reading Blueline Charts 12" nominal dia. for correct perspective and equal ease and accuracy of readings at low and high rates of flow (E).

3. BUILT-IN CALIBRATING DEVICE:
Accuracy of registration easily and quickly checked in the field by means of built-in water head test pipe (F).

4. UNAFFECTED BY TRAPPED AIR:
Trapped air has no effect on accuracy; air easily removed through a valve at the top of each well (G and H).

5. MEEHANITE IRON:
Mercury wells (I), main bracket on which mechanism and wells are mounted (J), and float (B) are high-tensile MEEHANITE iron.

6. HIGH ACCURACY — WIDE RANGE:
Registration with plus or minus 1% (response to differential induced by actual flow rate) over range of 100% to 6⅔% capacity for Model MDUA; within plus or minus ½% from 100% to 50% and within plus or minus 1% from 50% to 5% of capacity for Model MDUAX.

7. POSITIVE OVERLOAD CHECK:
Check valve (K) prevents loss of mercury even at extreme overload differentials.

8. LONG LIFE:
Type M Instruments installed over thirty-five years ago are still "going strong"!

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BUILDERS PROVIDENCE
Instruments

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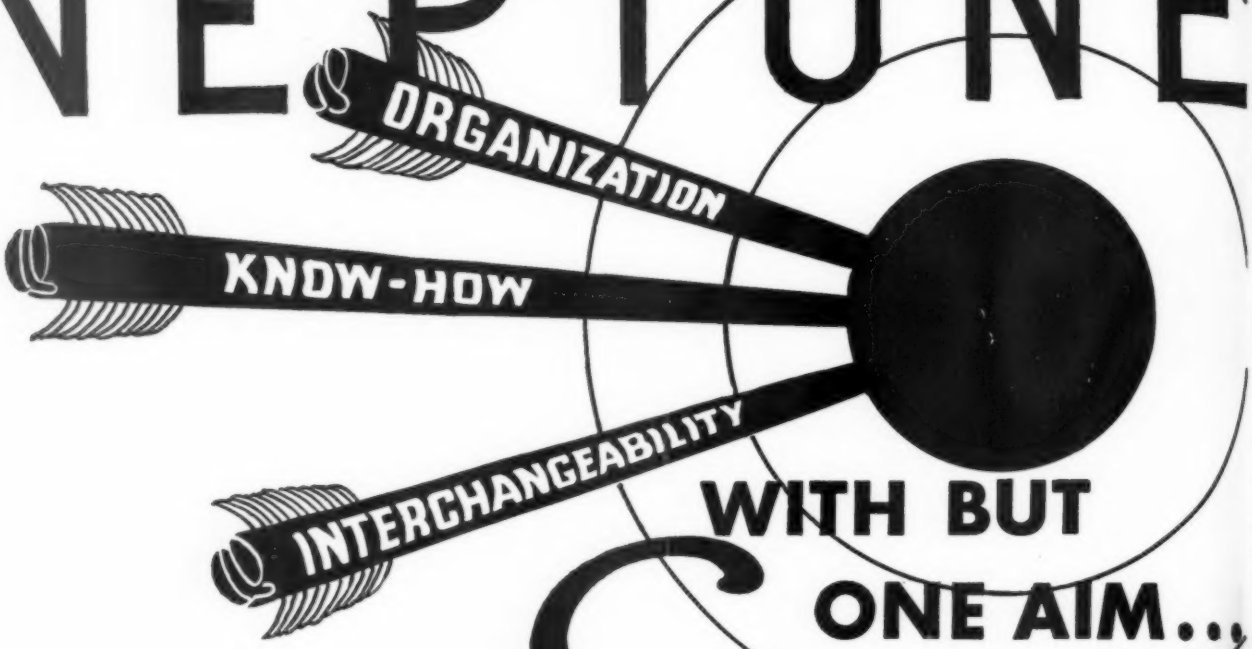

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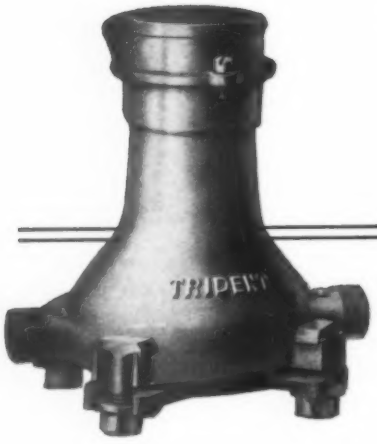
by Neptune's experienced nationwide Sales and Service Organization, which is always ready to help you with your metering problems.

You benefit
by Neptune's highly skilled Factory Organization and know-how of meter design and construction, which today, as for years past, produces water meters of highest quality.

You benefit
by Neptune's well-known Policy, established for over 50 years, of INTERCHANGEABILITY of Meters and Parts, which protects your meter investment and makes the Trident Meter the easiest and least expensive to maintain at highest accuracy for the continuous production of maximum revenue.

191



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WATER & SEWAGE WORKS

VOL. 95. NO. 6 JUNE, 1948

A Gillette Publication

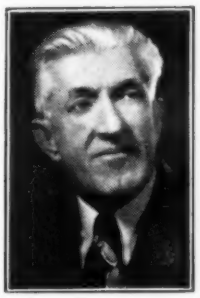
A.W.W.A. HOLDS RECORD CONVENTION IN ATLANTIC CITY

Attendance Tops All Previous Meetings

Retiring President
N. T. Veatch
Cons. Engr.
Kansas City
Mo.

Incoming President
L. H. Enslow
Editor
Water & Sew. Works
New York

A.W.W.A. Officers



Vice President
Dr. A. P. Black
Prof. of Chem.
Univ. of Florida
Gainesville, Fla.

Treasurer
W. W. Brush
Editor
Water Works Engr.
New York

Exec. Secy.
H. E. Jordan
Secy.-Editor
A. W. W. A.
New York

NOTHING is more dismal than the seashore on a rainy day. Even the fabulous Boardwalk in Atlantic City can't draw a crowd on a cold, raw, wet, windy, May day or during a pelting rain sweeping in from a gray Atlantic Ocean. Repeat that "dreary" weather on three out of five days, and a severe electrical and rainstorm on a Sunday night and you have a picture of the Atlantic City Convention of the A.W.W.A. on May 2-7 inclusive. But even the "dismal" weather failed to "dampen" the enthusiasm of a record breaking attendance of 1704 water works men and their families at this 68th annual conference of A.W.W.A.

The three-day visit of J. Pluvius (Mon., Wed., Fri.) did rather interfere with the pleasures Atlantic City has to offer (including many famed eating places) but for the men there was ample "food for thought" in the 18 technical sessions, and the 82 manufacturers' exhibits covering nearly 14,000 sq. ft. of floor space in the huge auditorium. In addition there were committee sessions, Board meetings, breakfast meetings, luncheon meetings, dinner meetings, and division organizational sessions, to say nothing of the evening entertainment to keep one busy from morning until late night hours.

Expectations that this would be a record convention ran high on Monday when more than 1200 persons signed in, but on Tuesday and Wednesday it looked somewhat doubtful that last year's 1546 attendance would be topped. Thursday, however, saw the registration line lengthen again and before noon the record was broken, soaring to the unexpected total of 1704 by the end of the day.

Hosts for the meeting were the members of the N. J. Section of A.W.W.A. At or near the registration desk and entrance to the exhibit hall there were always two or more Jersey members to answer questions, welcome newcomers or to generally be of service. At each technical session, too, a

C. P. Hoover
Supt. Filt.
Columbus
Ohio

Honorary Memberships
L. R. Howson
Cons. Engr.
Chicago
Ill.

Abel Wolman
Prof. San. Engr.
Johns Hopkins U.
Baltimore, Md.

member of the N. J. Section served as associate presiding officer, being generally helpful in the conduct of the various sessions.

For many water works men, the convention began on Friday night, April 30, when the South Jersey Water Association of Superintendents held its 21st Annual Meeting, and its 19th Annual Shad Dinner. This affair was held at the Salem Country Club, Salem, N. J., and included besides the business meeting, and the Shad Dinner, a reception for Linn Enslow, Pres. Elect of A.W.W.A., and a reception for Harry P. Croft, for thirty years Chief Engineer of the N. J. State Dept. of Health. Entertainment included not only Harry Taylor and his acts but also "Bill" Orchard and one of his entertaining quiz contests.

One other extra-curricular meeting was that of the Pennsylvania Municipal Authorities Association which was addressed by N. T. Veatch, Pres. of A.W.W.A., at its Wednesday afternoon session and by this reporter (G.E.S.) who talked on Public Relations at the dinner session.

Many registrants arrived on Sunday afternoon and evening, and that evening witnessed motion pictures of the 1947 San Francisco Convention Trip. These movies had been taken and edited, and were presented by Bernal Swab of Toledo, O. They were so well done and so popular that a repeat showing, on request, was made on Thursday afternoon.

For the women registrants there was a card party, a luncheon, and a much postponed rolling chair ride on the Boardwalk, plus two dances (also enjoyed by the men) and the banquet. A golf tournament at Seaview Country Club drew a few hardy souls in the rain. Several women also competed. This year there was no scheduled entertainment for the ladies on the afternoon of the annual banquet; a consideration for which the ladies expressed thanks, privately, if not publicly.

Awards

A. Clinton Decker
San. Engr.
Tenn. Coal, Iron and R. R. Co.
Birmingham, Ala.
(Diven Medal)

M. P. Hatcher
Dir. of Water
Kansas City
Mo.
(Goodell Prize)

Evening Entertainment

In addition to the movies shown on Sunday evening, there was something doing every night of the convention. Monday night was "Family Night" at which "Bill" Orchard presented the "Voices and Talent of the Water Works Family." Ably accompanied by Grace (Mrs. Fred) Stuart at the piano, "Bill" and ten or so of the boys gave out with some rather neat harmonizing. In addition, Past President Wendell LaDue and President Tom Veatch talked briefly, and Allan Johnstone of Wallace and Tiernan made a very humorous talk on water and sanitation, disguised as he was, as a French general, complete with goatee and accent. For riotous fun, too, George Hagetter's act deserved the many encores received. It was an evening calculated to amuse and entertain, and it did just that.

Tuesday night was the annual President's Reception and Dance. According to the program all in attendance at the convention were invited to "meet the Veatches, and the Enslows and the Blacks and the Brushes—and then dance". We met them and many more both in and out of the receiving line, and the dancing was enjoyable and enjoyed by a goodly number of husbands and wives—and stags.

Wednesday night was called Gala Night and took place in the Auditorium. Before the entertainment went on, the exhibits were open in order that the ladies might see them. Entertainment was furnished by a number of professional acts, a couple of which made use of some rather willing, and some rather unwilling guests in the audience.

Thursday night saw more than a thousand diners crowded into the banquet hall to eat turkey and watch the presentation of the annual awards and the new officers. Dancing followed the banquet from ten until one.

Convention Committee Chairmen

Wm. J. Orchard
Gen. Mgr.
Wallace & Tiernan
Newark, N.J.
(Conv. Management)

Art. T. Clark
Secy.-Mgr.
W. S. W. M. A.
New York
(Exhibits)

E. A. Sigworth
Technical Sales
"Nuchar"
New York
(Transportation)

Jos. M. Wafer
Sales Mgr.
"Nuchar"
New York
(Entertainment)

C. B. Tygert
Dist. Mgr.
Wallace & Tiernan
Newark
(Section Host)

E. D. Sheehan
Supt. Water
Camden
New Jersey
(Dinner-Dance)

Manufacturers' Assn. Prexys

Retiring
Dan. J. Saunders
Vice Pres.
Permutit Co.
New York

Incoming
W. F. Rockwell
Chmn. of Board
Rockwell Mfg. Co.
Pittsburgh, Pa.

A.W.W.A.'s New Officers

Following the banquet which was presided over by retiring president N. T. (Tom) Veatch, Cons. Engr. of Kansas City, the new officers of the association were presented as follows:

President
Linn H. Enslow, Editor
Water & Sewage Works
New York City

Vice President
Dr. A. P. Black, Prof. of Chem.
University of Florida
Gainesville, Fla.

Treasurer
W. W. Brush, Editor
Water Works Engineering
New York City

Exec. Secretary
Harry E. Jordan
New York City

A.W.W.A. Awards

Presentation of **Honorary Memberships** went to three outstanding personalities this year: CHARLES POTTER HOOVER, Supt. of Filtration, Columbus, Ohio; LOUIS RICHARD HOWSON, Cons. Engr., Chicago, Ill.; and ABEL WOLMAN, Prof. of San. Engineering, Johns Hopkins University, Baltimore, Md. Both Messrs. Howson and Wolman are past Presidents of A.W.W.A. and Diven Medalists, and Messrs. Hoover and Howson are Fuller Awardees.

The **Diven Medal** was awarded in absentia to ASBURY CLINTON DECKER, San. Engr., Tennessee Coal, Iron & R. R. Co., Birmingham, Ala. The award was made for his work as Chairman of the Committee which has developed the second edition of the Manual of Water Quality, now in the process of being edited.

The **John M. Goodell Prize** for the member who has made the most notable contribution to the science or practice of water works development was awarded to MELVIN PROSS HATCHER, Director, Div. of Water, Kansas City, Mo. for his paper presented in the *Journal* on "Water Works Rules and Regulations."

Twenty-two **George W. Fuller Awards** were made to members of local sections for services to or in the respective sections. Most of the award recipients were present to receive the awards in person. The following persons received the awards: Alden Williams Miller, Arizona Section; Loren Elsworth Blakely, California Sect.; Edward Victor Buchanan, Canadian Sect.; Jose Garcia Montes, Cuban Sect.; George Ernest Ferguson, Florida Sect.; Leon Small, Four States Sect.; Hans Victor Pederson, Iowa Sect.; Harry Wheeler Badley, Kansas Sect.; Ernest Elmer Jacobson, Ky.-Tenn. Sect.; John Anthony Keils, Michigan Sect.; Thomas Julian Skinker, Missouri Sect.; Malcolm Wade Plummer, Montana Sect.; Howard Thompson Critchlow, New Jersey Sect.; John M. Diven, New York Sect.; John Raymond Purser, Jr., No. Car. Sect.; Paul Dana Cook, Ohio Sect.; George Joseph Turre, Rocky Mountain Sect.; William Hugh Weir, Southeastern Sect.; Albert Herman Ullrich, Southwest Sect.; Charles Edward Moore, Virginia Sect.; Arthur Robert Todd, West Virginia Sect.; and Jerome Crosby Zufelt, Wisconsin Sect.

Florida and Ohio Sections Win Cups

The Henshaw Cup, awarded to the section holding the record for the highest percentage of members attending an annual meeting went to the Ohio Section with its record attendance of 65.8 per cent of its membership. Runner-up was No. Carolina Section with 63.9 per cent. (No. Carolina was runner-up in 1946 also.)

The Nicholas S. Hill Cup awarded annually to the section showing the largest percentage gain in membership during the year, was won by the Florida Section with a figure of 24.8 per cent. Runner-up was Michigan with a gain of 21.3 per cent.

As usual California won the "Old Oaken Bucket" emblematic of the largest membership. At the close of the year that section had a total membership of 714.

President's Inaugural Address

After the presentation of the various awards, the retiring president, N. T. Veatch, presented the incoming president, Linn H. Enslow, to the assembly. In a short, sincere acceptance address, Mr. Enslow called attention to the growth of the A.W.W.A. and the loss of members, to the need for upgrading members of the water works profession, as has been done for water works equipment and service, and to the dividend which each member receives for his ten dollars dues. For each ten dollars received per member, the A.W.W.A. spends $24 for services rendered to the members. This, says Mr. Enslow, is a tidy 140 per cent dividend. The incoming president also called attention to the interest of the membership in the Public Relations Work of the Association and the need for continuing that service.

W.S.W.M.A. Election

The annual meeting of the Water and Sewage Works Manufacturers' Assn. was held on Wednesday noon at the Ritz-Carlton Hotel. Following lunch which was presided over by retiring president Daniel J. Saunders, Vice Pres., Permutit Co., New York City, the meeting was addressed by George C. Sopp, Gen. Supt. of Meters and Services, Water, Power, and Light Dept., Los Angeles, Calif., and by Dexter Merriam Keezer, Ph.D., LL. D., Director of the Dept. of Economics, McGraw-Hill Publishing Co., New York City. Mr. Sopp spoke on "Water Problems in Southern California" and Dr. Keezer spoke on "The Business Outlook".

At this meeting the following member-companies were elected to the Board of Governors, effective Jan. 1, 1949: *Engineering News-Record;* National Water Main Cleaning Co.; General Electric Co.; Pittsburgh-Des Moines Steel Co.; and the Dorr Co. Holdover members of the Board include: Ford Meter Box Co.; Hersey Mfg. Co.; Hydraulic Development Co.; Neptune Meter Co.; Permutit Co.; Pittsburgh Equitable Meter Div.; *Public Works Magazine;*

M. B. Cunningham
Supt. & Engr.
Water Dept.
Oklahoma City, Okla.

K. V. Hill
Partner
Greeley & Hansen
Chicago, Ill.

Public Relations Program

W. S. Byrne
Gen. Mgr.
Met. Util. Dist.
Omaha, Neb.

Don O'Reilly
Pub. Rel. Dir.
Wash. Sub. San. Dist.
Hyattsville, Md.

E. L. Filby
Engr.
Black & Veatch
Kansas City, Mo.

Norma Nelson
Pub. Serv. Comm.
Halifax
Nova Scotia

A. P. Smith Mfg. Co.; U.S. Pipe and Fdry. Co.; and Wallace & Tiernan Co.

Officers of the W.S.W.M.A. elected to take office next January 1 are: *President*—Willard F. Rockwell, Chairman of the Board of Rockwell Mfg. Co., Pittsburgh, Pa.; *Vice President*—Reginald F. Hayes, Vice Pres. & Gen. Sales Mgr., Hydraulic Development Corp., New York City; *Treasurer*—Edgar J. Buttenheim, Pres. American City Magazine Corp.; and *Secy.-Mgr.* Arthur T. Clark, New York City.

Officers of A.W.W. A. Divisions

The several divisions of the A.W.W.A. met and transacted annual business including the election of officers. One step taken this year was the reorganization and consolidation of the Finance and Accounting Division and the Plant Management and Operation Division into one new division called the Water Works Management Division. Also this year a new division, called the Water Resources Division, was created. These two new divisions elected officers and drew up by-laws, but they do not become official divisions until passed on by the A.W.W.A. Board of Directors. Listed below are the new officers of the three divisions.

WATER PURIFICATION DIVISION

Chairman—I. M. Glace, Cons. Engr., Harrisburg, Pa.

Vice Chairman—Ray L. Derby, San. Engr., Dept. of Water, Light, and Power, Los Angeles, Calif.

Secretary—James E. Kerslake, Supt. of Filt., Milwaukee, Wisc.

Directors—H. E. Hudson, Chief Engr., Illinois State Water Survey, Urbana, Ill.; H. E. Lordley, Plant Manager, Dept. of Pub. Util., Richmond, Va.; and Past Chairman, Chas. R. Cox, New York State Dept. of Health, Albany, N.Y.

WATER WORKS MANAGEMENT DIVISION

Chairman—Melvin P. Hatcher, Director, Div. of Water, Kansas City, Mo.

Vice Chairman—Gerald A. Arnold, Director of Water, San Diego, Calif.

Secretary—L. J. Hoffman, Office Mgr., City Water Works, Akron, Ohio.

Directors—L. W. Grayson, Supt. of Water, Riverside, Calif.; J. L. Hawkins, Supt. of Water, Greenville, So. Car.

WATER RESOURCES DIVISION

Chairman—R. M. Leggette, Cons. Ground Water Geologist, New York City.

Vice Chairman—L. W. Grayson, Supt. of Water, Riverside, Calif.

Secretary—George E. Ferguson, Staff Officer, U.S. Geol. Survey, Washington, D. C.

Directors—H. E. Hudson, Chief Engr., Illinois State Water Survey, Urbana, Ill., and Paul Weir, Gen. Mgr. Atlanta Water Works, Atlanta, Ga.

W. R. La Due
Gen. Mgr.
Water & Sewerage
Akron, Ohio

Martin Fleutje
San. Engr.
Am. Water Wks. Co.
New York

Guy C. Northrop
President
Northrop & Co.
New York

Thos. F. Wolfe
Engineer
C. I. Pipe Res. Assn.
Chicago

Jos. Schwada
City Engr.
Milwaukee
Wisc.

W. V. Weir
Pres., St. Louis
Co. Water Co.
St. Louis, Mo.

Panel Discussion—Sulfur Jointing Compounds

PUBLIC RELATIONS

One of the most interesting sessions of the convention was that dealing with "THE PUBLIC RELATIONS PROGRAM—AN APPRAISAL." In opening the session, R. B. Cooney of Kelly-Nason Co., New York City, said that the real story was not yet complete; "The water works public relations job must be a local job." Mr. Cooney, who as a public relations counsel worked with the A.W.W.A. in preparing the Public Relations publications of the association, said that these pamphlets had sought to bring orderly form to the thinking of water works men on this subject.

As an example of how the public relations should work, Mr. Cooney told how to sell a project by taking the proper steps at each phase of the project. These steps should begin before the project is designed, continue through its construction, and cover the opening of the works.

On the subject of "DEALING WITH PUBLIC OFFICIALS", M. B. Cunningham, Supt. and Engr., City Water Dept., Oklahoma City, Okla., said that teamwork is needed between the water works operators and public officials. Both are needed on the team. There is always the problem of a difference of opinion and these must be resolved without friction. An alert water works official will always turn a disadvantage into an advantage. As to news, remember that it is perishable and therefore should be both short and interesting.

There are always three viewpoints to be reconciled, the water works manager's, the public officials' and the public's. Above all tell the public and the public officials the truth, using pictures where possible. And don't complain or expect the impossible to result from your attempts to establish good public relations.

In presenting a paper on "SELLING THE PEOPLE A PROJECT," Kenneth V. Hill, Engr., Greeley and Hansen, Chicago, Ill. described the project at Moline, Ill. This project included electrification and water softening for a community of 40,000 where 60 per cent of the water used is for industrial purposes.

Mr. Hill outlined the steps in selling the project. These included 1) appointment of a citizens' committee to study the problem, 2) appointment of engineers to plan the project, 3) study of the engineers' report, 4) a rate study (this one proposed a 33 per cent increase), 5) a study by financial houses, and 6) publicity to tell the people about it.

"PAID ADVERTISING AS A USEFUL TOOL" was the topic presented by Walter S. Byrne, Gen. Mgr., Metro. Utilities Dist., Omaha, Neb. Mr. Byrne said that the public is entitled to know what is going on and public

works should be conducted on the same plane as private enterprise. As to how to sell yourself, Mr. Byrne suggested trying a public relations counselor who can tell you when to say nothing. Whether or not paid publicity should be used is a debatable question, but Mr. Byrne believes in it because it is a controllable tool. What media to use, radio, newspapers, handbills? That is a study in itself and depends on the locality. Generally, newspapers think that only calamities are newsworthy stories, and it is difficult but necessary to combat this attitude.

When it comes to "PROMOTING GOOD PUBLICITY", it is worth listening to the advice of Don O'Reilly, Public Relations Director, Washington Suburban Sanitary Dist., Hyattsville, Md. Mr. O'Reilly was a working newspaperman for many years before becoming the first paid full time publicity director for a municipally owned plant (actually a district). To Mr. O'Reilly each phase of public relations is important and a public relations program is only as strong as its weakest link. Above all it is well worth while to get acquainted with the regular reporter on that beat. The reporter can and must slant a story and there is no reason why he can not slant it toward the water utility rather than away from it. When talking to newspaper reporters the utility manager should give them the story straight even if it has to be off the record. If you issue press releases, make them readable and tell the main story in the first two paragraphs.

In "MAKING FRIENDS WITH THE CUSTOMER," said E. L. Filby, of Black and Veatch, Engrs., Kansas City, the water works manager should remember that "a water utility, whether private or public, has but two things to sell, water and service. The customer is important and you must make him your friend. To make him a friend takes extra planning and "walking that extra mile". Contact with the customer is usually rather distant, but one can start with the new customer as he comes in to make application for water service. Use a smile, have a one stop desk where the customer can make all arrangements at one sitting, give him a folder that says something besides being a cold receipt and send him away with a friendly goodby.

Good meter reading service, prepayment of bills, and a branch payment office might do a great deal toward making the customer your friend. Where street barricades are necessary put a sales story on them. In short do all the little things that add up to making a customer a friend and keep everlastingly at it.

"HALIFAX CONSISTENT PROGRAM" has paid dividends according to Miss Norma Nelson, Public Service Commission, Halifax, Nova Scotia. The Halifax Utilities Commission was created in 1944 and has been public relations minded since its start. The Commission believes in fitting the basic principles of public relations to the local picture.

Among the steps taken in Halifax were the painting of the utility service trucks a bright orange with blue trim and a picture of "Willing Water"—At Your Service. Paid advertising is used, radio programs are employed, education in the schools is practiced, meter readers were outfitted with attractive uniforms and the office force was staffed with attractive girls.

Outstanding activities of the employees are publicized, and the utility trucks help distribute Christmas Dinner Packages to the needy. An effort has been made to make a friend of the newspapers and this has been helpful toward getting the "story" to some 90,000 consumers in this city founded 200 years ago. These are but a few of the practices which Halifax has utilized to make its public relations program pay dividends.

As an example of what can be done with home made movies, JOHN E. KLEINHENZ, Publicity and Advertising Director, Indianapolis Water Co., Indianapolis, Ind., showed the most recent one which he had prepared. Completely in color and with professional background music to carry the mood, the spoken commentary is narrated by Mr. Kleinhenz himself, because he believes that it is possible to better adapt the spoken commentary to the type of group before which the movie is being shown rather than have a stilted canned commentary. Mr. Kleinhenz's latest motion picture is the sixth in a series which he has done; it is a completely professional job done by an amateur, and it tells the story of the latest addition to the utility's facilities as well as showing the many uses to which water is put in the city and the many tests and control procedures used to safeguard the supply for the consumer.

As H. E. Jordan, A.W.W.A. Secy., pointed out, this motion picture shows what can be done without the necessity for expending large sums of money for professional photographers and studios. The commentary which Mr. Kleinhenz had written was excellent and will be quite enlightening to the average lay public audience which will see the film. Of the previous films which Mr. Kleinhenz has made, more than 100,000 persons have seen them in some 1036 showings.

Elwood Bean
Prin. Asst. Engr.
Bur. of Water
Philadelphia

Ted H. Kain
Gen. Mgr.
Columbia Water Co.
Columbia, Pa.

Air Conditioning and Water Conservation

Marsden C. Smith
Chief Engr.
Pub. Utilities
Richmond, Va.

Frank C. Amsbary
Manager
Ill. Water Serv. Co.
Urbana, Ill.

R. M. Roper
Gen. Mgr.
Bd. Water Comm.
East Orange, N.J.

L. B. Mishell
Engr.
Carrier Corp.
Philadelphia

JOINTING COMPOUNDS

One full session was devoted to the important consideration of sulfur jointing compounds for cast-iron pipe about which some adverse reports have been heard from time to time and with increasing emphasis during the past year. The session was conducted as an open session of the Committee on Water Works Practice in which factual information was presented for the benefit of the Committee in its effort to properly evaluate the reports

of disintegration of sulfur jointing compounds in service, and the swelling of such compounds to the extent of splitting the bells of cast-iron pipe and pitting of the pipe adjacent to the compound within the joint.

"PROPERTIES OF SULFUR JOINTING COMPOUNDS" by J. W. Estep, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Mr. Estep reported the findings from a study of the effects of various compositions of sulfur jointing compounds in resisting soil corrosion or attack by sulfur oxidizing organisms. Briquettes of compounds of various composition were buried in Pittsburgh, Pa., and Texas, where the soil was moist and teeming with sulfur bacteria. The major findings after five years in the soil revealed a weight loss of but 1 to 3 per cent in Pittsburgh soil, whereas in the sulfur bacteria teeming soil of Texas the weight loss by commercial sulfur jointing compound after 5 years amounted to 30 per cent. In the compounds of experimental composition the addition of copper proved detrimental. The best preserved specimens after five years in the destructive Texas soil were those to which fractions of a per cent of bactericidal beta-napthol and selenium salts had been added to the commercial compound, with beta-napthol proving overall the best preservative tried.

"BACTERIAL OXIDATION OF SULFUR IN PIPE JOINTING COMPOUNDS" by Dr. R. L. Starkey, Research Specialist, N.J. Agricultural Experiment Station, New Brunswick, N.J.

Dr. Starkey in reporting on the studies conducted by himself stated that practically all of the earlier published reports of sulfur joint compound failures had been based wholly on circumstantial evidence. However, such joint compounds are attacked by sulfur oxidizing bacteria when conditions are favorable for attack. The rate of oxidation of sulfur in the compound appears to be exceedingly slow unless the compound is pulverized. The greater the quantity of sulfur exposed the more rapid is the rate of sulfurous and sulfuric acid production and likewise the finer the particles of sulfur the more rapid is the rate of acid production. In the case of solid (fused) sulfur the oxidation and acid production is practically none. For this reason the use of plasticizers give marked protection to sulfur and sulfur compounds. In a study of the efficacy of germicidal agents added to sulfur jointing compounds it was found that sodium pentachlor phenate appears to be the best and most practical inhibitor of bacterial attack on the compound. The very small quantity required is especially interesting—namely, 0.05 per cent or only 500 parts per million. Next most practical and effective were the fluorides, the best of this group being sodium silico fluoride in minor quantities. Dr. Starkey concluded by recommending the use of sodium pentachlor phenate as the overall best inhibitor for commercial sulfur jointing compounds.

L. N. Thompson
Gen. Mgr.
Water Dept.
St. Paul, Minn.

Rennie I. Dodd
Exec. Mgr.
Mun. Auth. Water
Chester, Pa.

W. R. Wise
Mgr.-Engr.
Comm. Pub. Wks.
Newberry, S.C.

R. G. Yaxley
Supt. of Water
Waterford
N.Y.

Rate Increases

A Panel Discussion On Sulfur Jointing Compounds

A panel discussion of sulfur jointing compounds by users, manufacturers and purveyors of such compounds was participated in by seven individuals who reported as follows:

WENDELL R. LADUE, Chief Engr. and Supt., Bureau of Water & Sewerage, Akron, Ohio, reporting Akron's experience with a sulfur jointing compound since its introduction in 1912, a period of 36 years, stated that the difficulty had been very spotty and with no wholly adequate explanation. Chief difficulty had been the swelling of the compound and resultant breakage of cast-iron pipe bells and even a longitudinal splitting of the pipe. The other trouble had been a serious pitting of the exterior of the spigot end of the pipe adjacent to the joint compound and worm-like corrosion grooves within the joint—i.e., where the compound made contact with the cast-iron. Since 1930 better than 200 miles of mains in Akron have been jointed with compound but not until 1944 had troubles been experienced. However, bad experiences had been had with some joints less than 5 years old, without any satisfactory explanation. In June 1947 there had occurred 10 instances of main leaks due to splitting of the bell or pipe caused by swelling of the joint compound. This particular line was of 12 inch pipe laid only five years earlier. Mr. LaDue pointed out that there was no seasonal influence on the frequency of failures and none of the pipe manufacturers nor the compound producer had been able to explain the cause of the difficulty. He pointed out that regardless of the fact that only a small per cent of the joints had failed, the occurrence of such failures had been "darned" annoying, and always the question of how many more and how soon was hanging over the head of the water utility management.

THOMAS F. WOLFE, Research Engineer, Cast-Iron Pipe Ass'n., Chicago, in speaking for the cast-iron pipe industry was of the opinion that the matter of jointing of pipe should be the choice of the user. The sulfur compounds in themselves had been very satisfactory except where attack had been due to anaerobic corrosion and presumedly bacterial oxidation of the sulfur within the compound. As a corrective of such conditions it was suggested that sand back-fill around the joints be employed. Also, the use of bactericidal inhibitors in the compound sounded promising. The third alternative was the use of other jointing materials such as cement or the use of the newer flexible mechanical joints such as are extensively employed in jointing cast-iron pipes by the gas industry and recently by water utilities..

MARTIN E. FLENTJE, Research Engineer, American Water Works Company, New York, reporting as a user and investigator, stated that sulfur compound joint failures had been scattered over a number of properties of his company. Most prevalent had been the swelling of joints with resultant splitting of the bells and pipe and marked serious pitting of the pipe adjacent to the compound—both on the outside and interior. Specimens exhibited revealed a groove circling the pipe immediately at the compound face on the exterior, and spotty honeycombing of the bell on the interior. The pitting on the exterior had been most prevalent in wet soil and areas of higher salinity. While bacteria seem to have an influence, it must be

recalled the sulfide of iron is a cathodic material and in an electrolyte the cast-iron pipe could well be the anode, thus setting up cathodic corrosion due to galvanic effects.

C. R. PAYNE, Technical Director, Atlas Mineral Products Co., Mertztown, Pa., stated that no proof existed that joint attack is due to bacterial activity and he could more readily accept the galvanic theory of attack because of the effects of variation in soil composition and water content. Graphite is cathodic to cast-iron and therefore is to be considered as the cause of galvanic attack. Mr. Payne said that as the result of research sodium silico fluoride had been added to "Tegul Mineral-lead" during the past year as one of the most effective inhibitors studied.

JOSEPH P. SCHWADA, City Engineer of Milwaukee, Wisc., reported two distinctive types of deterioration slowing down of disintegration rate. To date there had been no actual failures of joints, but it was only a matter of time.

GUY C. NORTHROP, President, Northrop & Company, Inc., Spring Valley, N.Y., (mfgrs. of "Bondo" compound) pointed out that more than 150 million pounds of sulfur jointing compounds had been used during the last decade at a saving of about 40 million dollars for jointing plus another 40 million saved in the form of less joint leakage. Studies under way with "Bondo" for the past 30 months show no evidence of corrosion above ground and submerged test cylinders show no evidence of corrosion or swelling. Since the first of the year an inhibitor has been added to "Bondo." In producing jointing compounds that will hold up under all conditions, Mr. Northrop said that the manufacturers had a real responsi-

stopped through use of Dresser Bell-Joint Clamps.

JOHN S. LONGWELL, Chief Engr., and Genl. Mgr., East Bay Munic. Utility Distr., Oakland, Calif., reported that their experience had been similar to that of Milwaukee. Use of compounds for jointing was begun in 1930 and 5 to 6 years later an increasing number of leaks and bell breaks were reported. In 1941 the use of sulfur compounds was discontinued.

ALVIN KUECKER, Supt. Distrib. and Maint., Elgin, Ill., reported that compound joints had given trouble due to the fact that the Elgin water contained hydrogen sulfide. After experiencing 15 to 20 blown joints per year compounds had been discontinued.

LAWRENCE E. GOIT, Chief Engr., & Deputy Mgr., Dept. of Water & Power, Los Angeles, Calif., reported no difficulty with sulfur compound

S. T. Anderson
Gen. Supt.
Water Dept.
Springfield, Ill.

G. E. Arnold
Director
Water Dept.
San Diego, Cal.

C. M. McCord
Director
Water Div.
Memphis, Tenn.

W. C. Morse
Supt.
Water Dept.
Seattle, Wash.

Service Extensions to Suburban Areas

Paul Weir
Gen. Mgr.
Water Dept.
Atlanta, Ga.

W. C. Wills
Mgr. & Ch. Engr.
Water Dept.
Wilmington, Del.

of joint and pipe. Graphitization of the pipe had been noted adjacent to the jointing compound and particularly had the top half of the pipe suffered loss of metal at the spigot end. Accompanying this phenomena disintegration of the joint had been observed from the outside inwards and also to a lesser degree on the inside next to the jute also. Chemical analyses of the compound removed revealed loss of sulfur in various degrees and at various rates. Since the melting of the compound and pouring of the joints had been supervised by the compound supplier, the cause could not have been physical or mechanical. There had been no trouble with lead joints under identical conditions. On the soil side the sulfur content of joints had been reduced after 10 years from 46 per cent to 19.8 per cent. Adjacent to the packing the sulfur content was reduced only to 40 per cent. In reply to a question Mr. Schwada stated that the rate of joint disintegration appeared to follow a straight line depreciation curve rather than a gradual

bility. Any producer offering a deficient compound can ill afford not to recognize the necessity of making corrections in its composition.

W. VICTOR WEIR, President and Genl. Mgr. St. Louis County Water Co., St. Louis, Mo., with 660 miles of mains jointed with sulfur jointing compound during the past 23 years, reported that 50,000 of these joints were 20 or more years old. As to failures, only 27 joints had given trouble and these joints had been in wet soil for the most part. During the same period 14 lead joints had required recaulking. Such experience led Mr. Weir to conclude that sulfur compound joints could be considered satisfactory on the whole in St. Louis County except in a limited area where environmental conditions apparently caused deterioration. It was his opinion that this weakness probably could, and should, be corrected by the compound manufacturers.

J. W. MCAMISS, Supt. of Water and Sewerage, Greenville, Tenn., reported trouble with one line with compound joints. These leaks had been

joints during first 10 years, after which numerous leaks and compound disintegration caused a replacement of all such joints with cement mortar, which has since been standard practice on the Los Angeles system.

THOMAS J. SKINKER, Water Commissioner, St. Louis, Mo., reported several hundred miles of mains with compound joints. While there had been some difficulty under non-paved streets, less trouble was experienced under paved streets.

ROBERT S. MILLAR, Manager, Wichita Water Co., Wichita, Kan., reported that joint breaks, mostly split bells, had been increasing with the passing of time.

CHAS. J. ALFKE, Exec. Vice Pres., Hackensack Water Co., Hackensack, N.J., reported the use of sulfur jointing compounds on the Hackensack system since 1928 without experiencing difficulties to date.

ROGER W. ESTY, Supt. of Water and Sewerage, Danvers, Mass., having heard of reported deficiencies of sulfur compound joints, sent out a questionnaire to New England super-

intendents. Of the 27 replies all reported satisfactory experiences with compound joints. These same men reported more leakage with lead joints than compound joints where vibration could be blamed for such leakage. To him it was apparent from the reports of members in attendance that A.W.W.A. should develop specifications for all jointing materials, including the sulfur compounds, as perhaps of most immediate concern to the greatest number.

Ed. Note: It was apparent from the experiences recorded in this session, and other evidence, that for the most part the sulfur compounds have proved to be satisfactory jointing materials, but that certain environmental conditions have been the cause of disintegration of such joints, pipe pitting or pipe splitting due to swelling of the compound in place. The exact causes for such spotty failures are yet to be satisfactorily explained, and the need for further study of the problem is evident. There is considerable evidence, however, that bacterial activity and galvanic phenomena are each responsible to a considerable degree—possibly in combination. The addition of inhibitors to the sulfur compounds appears to be indicated as the most practical means of checking joint depreciation and acid production attributable to biological sulfur oxidation, which in turn may well be responsible for galvanic corrosion and pitting which may be considered a form of electrolysis or electro-plating in reverse.

ELEVATED TANK MAINTENANCE PRACTICE

[An open hearing of the 7 H Water Works Practice Committee — Vice-Chairman Reeves J. Newsom, presiding.]

Another important A.W.W.A. program innovation was represented by the closing session of the convention, which was wholly devoted to a hearing by the Water Works Practice Committee of those who wished to criticize or offer suggested additions or changes to the proposed revised text of "Recommended Practices in Repairing and Repainting of Steel Water Storage Tanks", recently issued for the purpose of review by the Water Works Practice Committee. To this hearing all known tank manufacturers and tank maintenance and repair firms were invited to discuss the tentative practices document, copies of which had been supplied each firm well in advance of the hearing.

Louis R. Howson, speaking as chairman of the Water Works Practice Committee, on Standpipes and Elevated Tanks, opened the session with a brief review of the more important sections of the revised "Recommended Practices" document, in which he emphasized the importance of a preliminary inspection of the tank by a competent independent inspector and then taking the inspector's recommendations into consideration before securing bids for repair work if any is found needed or before awarding a contract if a bid has already been made. In all cases repair work should be covered in a separate contract from that for painting.

Whitworth Stokes, Atty. at Law, Nashville, Tenn., appeared as the spokesman for Dixie Tank & Bridge Co. in company with W. A. Riley, president of the Company.

While space limitation precludes any detailed coverage of the well prepared bill of exceptions, presented by Mr. Stokes in clean-cut fashion, it should be said that a favorable impression was made on the Committee and the audience, many of the exceptions and suggested changes presented being acceptable to the Committee.

While the preliminary nature of the hearing and the free exchange of opinions and argument renders it inadvisable to give detailed coverage of this session, the well prepared bill of agreements and exceptions presented by Mr. Stokes for his client contained certain exceptions and suggested changes that appeared immediately acceptable to the Committee. There were others, admitted to be controversial, which were promised consideration and further study by the Committee.

Mr. Kingsley, President, National Tank Maintenance Corp., heard as the representative of his company, voiced exceptions to certain of the Committee's recommendations pertaining to the exploratory inspection incident to awarding contracts for repairs and/or painting.

CATHODIC PROTECTION

"Experimental Studies of Cathodic Protection for Elevated Storage Tanks", by Peter E. Pallo, Asst. Sanitary Engr., Hackensack Water Co., New Milford, N. J.

Mr. Pallo reported on the findings during a five month experimental study of cathodic protection for water tanks on the system of the Hackensack Water Company which supplies a soft filtered water. Four pilot plant sized tanks were constructed from a length of large diameter steel pipe cut into equal lengths. Thus the metal in each experimental tank was of the same composition and structure. The corrosion pattern of each proved identical without protection. All of the tanks were sanded down to bright metal.

One unit, operated without protection of any sort, constituted the "control". One unit was equipped with the electrodeless system, in which wall units attached to the tank exterior provide the current input. The third unit was equipped with a Dow Magnesium Electrode suspended at tank center but without current input. The fourth was equipped with a single aluminum anode at tank center and supplied with rectified current.

The four tanks were operated in parallel as fill and draw units filled and emptied daily. Water samples from the four metal tanks and a stoneware crock were taken daily and examined for pH, alkalinity, turbidity, color, dissolved oxygen and iron. Also the metal tanks were weighed for weight losses as the study progressed.

Family Night Party

Prexy Tom Veatch Receives Gift from N.J. Section — *General Pierre Talking on Dehydrated Water* — *The Cooks and Wa(i)ter Boys and Jane Orchard Sing "Now Is the Hour"* — *M. C. W. C. (Bill) Orchard Gives Out on Squeeze Box* — *W. R. La Due "The Buckeye Is a Smooth Nut with No Nutritive Value"*

The study revealed that the electrodeless tank with exterior wall electrodes suffered the greatest weight loss and the water therein picked up the greatest quantity of iron. The least weight loss (.014 per cent) and the lowest iron pick-up was recorded for the tank with the single aluminum electrode. The next least weight loss (0.67 per cent) was observed on the tank with the Dow Magnesium Anode.

Surprisingly enough the tank equipped with the exterior wall electrodes suffered weight losses actually in excess of the control tank without protection. Pitting was pronounced. Examination of the large tank on the Hackensack system protected with the electrodeless system revealed the same condition—namely, pronounced pitting in the areas immediately adjacent to the exterior wall units.

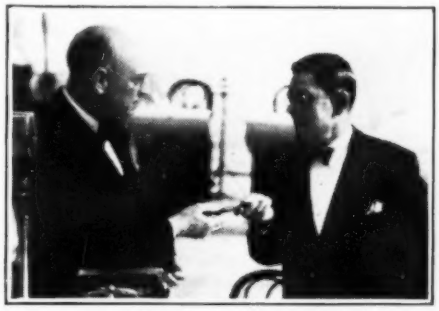
The protective scale deposited on the tank walls by the magnesium electrode consisted of calcium and magnesium carbonates, some iron and aluminum. The scale on the unit equipped with the aluminum electrode was of a similar composition with the silica in addition, the thickest deposit being on the vertical wall streaks which had corroded most rapidly before protection was applied, thus indicating that protection was being concentrated at the most vulnerable points to corrosive activity. Beneath the protective scale the metal was bright. For the first three weeks no deposition was visible.

Studies of dissolved oxygen depletion revealed the least depletion in the unit equipped with the aluminum electrode providing current input. Only slightly greater oxygen depletion was observed with the magnesium electrode. No color or turbidity increase was noted in these two units in contrast to the other two.

Conclusion reached from the Hackensack studies were that cathodic protection is effective and dependable when the installation is properly designed and installed, with especial attention being given the spacing and location of the anodes. The socalled electrodeless circuit was found more damaging to tank walls than protective, both on the experimental unit and the large tank.

Asked if his studies would indicate that cathodic protection properly designed and operated could be relied upon without also providing an initial protective paint coating to new tanks, Mr. Pallo replied that properly designed he considered that it would, although the overall current cost might not make the practice as attractive economically.

A question concerning the relationship between the quality of water and the effectiveness of cathodic protection was answered by a representative of the Electro-Rustproofing Corp., who stated that water quality is an all important factor in installation design. He cited an instance wherein the switch from water of higher hardness to a softer water required a change in design of the cathodic system to cope with the lowered conductivity and reduced calcium content of the new water.



The Gavel Changes Hands
Retiring President N. T. Veatch Hands Symbol of Office to L. H. Enslow at Annual Banquet

GENERAL SESSION

(Reported by Charles H. Capen, Jr., Chief Engineer, North Jersey District Water Sup. Comm., Wanaque, N.J.)

The General Session, held on Wednesday afternoon, was devoted to the subject of rate increases in bonds. This session was presided over by W. R. LaDue, past president of A.W.W.A., and Ch. Engr., Water and Sewerage, Akron, Ohio, with co-chairman, J. L. Hawkins, Supt., City Water Works, Greenville, S. C., and C. H. Capen of Wanaque, N. J., acting as associate presiding officer.

Rate Increases

Four speakers presented views on "DEALING WITH THE PUBLIC IN OBTAINING RATE INCREASES." The first of these was Leonard N. Thompson, Gen. Mgr., Water Dept., St. Paul, Minnesota. Mr. Thompson said that St. Paul may have been the first community to raise its water rates since costs started up in 1942. They had obtained their second raise in rates in 1947. The average raise is 17 per cent on consumption only and the steps have been so changed as to make the raise equivalent to 10 per cent to the first consumer and 45 per cent to the large user.

In St. Paul, the greatest controversy over rates has been over the 10 per cent discount. This is a political question. Much of the success of "selling" the rate raise to the city was due to a sympathetic press, as well as an understanding public and a good Water Board.

According to Mr. Thompson, "Never before have rates been more important." If rates are not raised now, they may have to be raised in the future, when prices are on a decline. This would be bad. According to Mr. Thompson, when a new rate schedule is to be put in effect, the water utility should prepare at once for a future change, even if it is five or ten years hence. A water utility must sell the idea to the public that water is valuable and it must have the proper support of the press and good public relations. Mr. Thompson closed with the statement, "Let's not be apologetic about rate increases."

The second speaker on this topic of rate increases was RENNIE I. DODD, Exec. Mgr., Chester Municipal Authority Water Service, Chester, Pa. Mr. Dodd stated that the Chester Water Authority had raised its rates 51 per cent, as of November 1, 1946. The water utility had obtained its water supply from the Delaware River, as a main source, and serves a hundred thousand population. This source of supply became polluted and saline and in 1929 the company indicated that a new source could be obtained only with higher rates. The Water Authority purchased the plant from the private company in 1939 and, in 1946, made a study for a new supply, in which they had to negotiate for land areas.

The Authority gave the story to the press under secrecy, purchased the land, and released the story to the public. The public was then sold the necessity of raising the rates 51 per cent, and this was done by keeping them informed by way of press, movies, etc. Among other means of

Four of the Twenty-two Fuller Awardees

Jose G. Montes, Cuban Sect. — *H. W. Badley, Kansas Sect.* — *Thos. J. Skinker, Missouri Sect.* — *Paul Cook, Ohio Sect.*

keeping the public informed was to school all employees to answer any questions that might be put to them by friends and neighbors. The 51 per cent increase was accepted by the municipality, and in March of this year, contracts were let for the new source of supply.

W. R. Wise, Mgr.-Engr., Commission of Public Works, Newbury, S. C., next spoke on the subject of obtaining rate increases. Newbury, S. C. has a population of 10,000 persons, or less. The supply is operated by an elected board of three commissioners. It was obvious during the war, when there was no expansion, that the limit of the water supply would be reached by 1949. A Citizens' Committee called a meeting in 1946, to discuss the matter of enlarging the system and raising the rates. The first meeting drew less than fifty persons, in spite of publicity. A second meeting drew more, but was still poor. The complete story of the proposed raise in rates was presented to these meetings and all persons present concurred. A State Law was passed to permit Revenue Bonds to be issued.

Thereafter, each consumer was polled by a return post card regarding an increase of 50 per cent in water rates and 45 per cent in electric rates. In the letter accompanying the return card, the matter was explained completely. These cards were mailed on August 5, 1946, and by August 30th the last reply was received. Of 1,505 sent out, 818 were returned, 509 being in favor and 309 against. Thereafter the rates were increased approximately 55 per cent and during the first month under the new rates, there were only three complaints. Mr. Wise believes that keeping the people informed of all changes is essential to good public relations, particularly when it involves raising rates.

The last speaker on the subject was Gordon R. Yaxley, Supt. of Water, Waterford, N. Y. According to Mr. Yaxley, the problem of public relations in a small town such as Waterford, is different than in a large town. He believes that one should start at least fifteen years ahead to obtain good will for rate increases. Proper operation of plant is most important, no matter how good the plant, and a board of water commissioners is better than a council.

Mr. Yaxley told a number of amusing experiences in regard to consumer problems. In a small community, most of these problems must be taken up with the ladies—such items as a broken line under a garage causing a water bill to be equal to one-fourth of that for the past five-year period, and freezing of water lines, because the water was not shut off when the lady of the house went to Florida. In this particular instance, the superintendent was not informed, but the lady called the superintendent a "dirty, lying, stinking skunk." In another instance, some operators of an illicit still wanted a meter placed on the water line to the still, but desired that the operation of the still be kept secret.

Mr. Yaxley believes that word of mouth is the best public relations in a small town and that if the public is properly informed when additions are needed, rates may be raised. This was done in Waterford, with no adverse reaction. Several consumers asked why it had not been done before.

These papers brought a lively discussion on rate raising and public relations by the use of radios, newspapers, etc.

Municipal Bonds

In regard to "The Outlook for Municipal Bonds," Frederick L. Bird, director of Municipal Research, Municipal Service Department of Dun & Bradstreet, Inc., New York, N. Y., said that the most serious problem today is the effect inflation has had on rate structures. There was no way of telling that this would occur, according to Mr. Bird. Not only have costs of construction increased, but the cost of borrowing may increase. It is this latter thought that was the subject of Mr. Bird's discussion.

Interest rates were lowest in the spring of 1946. At that time, the Bond Index was 1.29 per cent for 20-year bonds. Then the rise began. By December of 1946, the index was 1.9 per cent; in February, 1948 it was 2.48 per cent; and as of May 1, 1948, it was 2.34 per cent. There is little prospect for lower interest rates, and for long-term bonds, the rates will probably be higher. Rates will go up for four types of securities.

The main factor in this change in interest rates has been supply and demand. From 1942 to 1946, there were only three hundred million dollars worth of bonds instead of the billions which had been issued in prior years. The Federal Income Tax likewise had its effect. There was a demand for 1 per cent tax-free bonds.

The recent cut in Federal Income Tax will cause rates to increase. Municipal bonds will have to seek a market with still higher rates and will come in competition with corporate bonds with 2¾ and 3 per cent interest rates. The quality of the bonds will become increasingly important. Recent bond issues have varied from 1.65 up to 4 per cent interest. Discrimination may be expected to increase, particularly when the post war boom gives signs of declining. The primary requirements for a good bond is to give the best pledge possible.

According to Mr. Bird, water bonds have an exceptionally good security factor, but careful planning and expert advice, plus good local bond laws, are needed. There is no inherent value in Revenue Bonds and Mr. Bird suggests that the A.W.W.A. could help rectify defects in state bond laws.

Mr. Bird said further that too much management is as bad as not enough. Municipal authorities are sometimes poor. They are generally best for groups, in some instances. It is essential that an authority or a municipality have good administration, good rates, good accounting and charging for services rendered with good annual statements, in order to get favorable recognition for bonds.

In closing, Mr. Bird suggested that it pays to advertise the quality of the bonds well in advance. Cooperation from the Chamber of Commerce with reference to facts about the community and physical characters of water system, accounting, etc., are helpful. Many cities are not getting the best rates. There appears to be a field for sale among medium class investors, who may never have owned a municipal bond.

In the discussion which followed, Paul Weir, Gen. Mgr., Atlanta, (Ga.) Water Works, asked if a change of revenue set aside to borrow on, from 10 per cent to 20 per cent would affect the interest rates. Mr. Bird answered that it was difficult to say, depending on bond schedules, although possibly the practice might help.

Wendell R. La Due, Gen. Mgr., Water and Sewerage, Akron, Ohio, pointed out that Mortgage Revenue vs. General Obligation Bonds depended on the manner in which the water department is run. Mortgage Revenue Bonds are better if the Water Department is well run, while the city is not. In some cities the reverse is true. The best situation exists when both revenue and credit are pledged. Mr. La Due believes the local bond laws of states should be flexible enough to permit the best combination.

Service Extensions

"Service Extensions to Suburban Areas and Rates for Suburban Water Users" was the subject

of the closing panel discussion of this General Session. The first speaker on this subject was S. T. ANDERSON, Supt., Water, Light and Power Dept., Springfield, Ill. In Springfield, there are four separate methods of extending service to suburban areas: (1) By special assessment, in which hearings are held and ordinances passed, the assessments estimated and payments made over a three-year period; (2) By certificate plan, in which the main is laid at the owner's expense, with a certificate issued, and no interest charged. Thirty-five feet are allowed for each customer, free; (3) The new customer plan for undeveloped areas in the city, where 35 feet of main is allowed free for each customer; and (4) Water extension by contract for outside users. In this plan, drawings and estimates are made, deposit to the amount of the estimate is required, and after a 12-year period, the main reverts to the city. Refunds to the contractor are made for new taps. Rates for all extension areas are the same as those for the city.

GERALD E. ARNOLD, Director, Water Dept., San Diego, Calif., said that the old Spanish Law Pueblo rights held in that city. There were no extensions beyond the Pueblo rights. The rates outside are high, except for fixed contracts, but they can be adjusted. Some times the need for water by outlying areas forces annexation of the area to the city. Mr. Arnold said that they had had some sad experiences in San Diego when water had been exchanged for right of way. He advised against this practice.

The next speaker on this subject was M. B. CUNNINGHAM, Supt. and Engr. City Water Dept., Oklahoma City, Okla. Mr. Cunningham said that in his city a lack of laws hurt the operation of the water works in regard to suburban area extensions. Generally a plan is drawn when the application is made, and upon completion of laying the main, the developer pays the contractor, and then the city takes over. When revenue reaches 10 per cent of the cost, 50 per cent is taken out and refunded. Rates outside the city are 50 per cent above those within the city, up to one-half million gallons a day. Thereafter, the rates are the same outside as inside the city.

On this subject of suburban extensions, C. M. MCCORD, Dir., Water Div., Memphis, Tennessee, said that his city was not obligated unless the water supply is adequate. Cost to different zones outside the city varies. In Zone 1 the developers put up the cost of the feeder main, with credit for so many feet per connection. In Zone 2 the cost of the extension is charged, plus all of the feeder main. One refund is made. In Zone 3 extension and feeder are charged to the contractor, or the developer, and no refunds are made.

On this same subject, W. C. MORSE, Supt. Water Dept., Seattle, Washington, said that he had no problem in extension. All extensions are paid for in full by property owners. Rates are 50 per cent higher for suburban areas than within the city. No sewage service is given. Another method used by Mr. Morse is a charge of $1 per month for service up to several years. For a third, each owner pays so much of the cost.

W. COMPTON MILLS, Mgr. and Ch. Engr., Water Dept. Wilmington, Del., said his utility may extend water mains to a 10-mile area. Rates outside of the city are double those within, except to industry. Many of the mains outside of the city area were laid by state and federal aid.

In concluding the formal presentation of this part of the program, PAUL WEIR, Gen. Mgr., Atlanta Water Works, said that water was sold outside of the corporate limits by either wholesaling or retailing. In the case of wholesaling, all mains are paid for in advance and turned over to the city. In the case of retailing, the minimum charge is $2 per month for 6,000 gallons. All 2-in. lines installed are paid for by the customer, while 6-in. lines are installed by the city, but the applicant pays other costs.

During the question and answer period, following these papers, MELVIN P. HATCHER, Dir. of Water, Kansas City, Mo., asked whether suburban rates could be varied to be commensurate with service. One of the speakers replied that the answer was no. To which Mr. Hatcher commented that transportation costs of the water should be computed for determining rates to suburban areas.

AIR CONDITIONING

The first panel discussion of the convention was devoted to the subject of RATES AND REGULATIONS FOR WATER USED FOR AIR CONDITIONING. This session was presided over by President N. T. Veatch, with D. D. Gross as Co-Chairman and L. E. Leedom as Associate Presiding Officer.

FRANK C. AMSBARY, Manager, Illinois Water Service, Urbana, Ill. was the Panel Moderator. In opening the discussion, Mr. Amsbary pointed out that the use of water for air conditioning varied markedly with the seasonal temperature. Air conditioning is here to stay and the number of such installations is bound to increase. Although this water use is a source of revenue, controls are needed and a water utility should set up controls before the adoption of air conditioning is widespread. Among the points to be considered in reference to controls of air conditioning as a water user are the available supply, peak demands, which usually fall within an 8 to 12 hour period, water conservation, rates, surcharges, and related topics.

First speaker on the subject was T. H. KAIN, Gen. Mgr. Columbia Water Co., Columbia, Penna. Mr. Kain emphasized the fact that rate control is less important than the pre-

A.W.W.A. Awards

President N. T. (Tom) Veatch Presents Annual Awards to: Abel Wolman (Honorary Member); Melvin P. Hatcher (Goodell Prize); Louis R. Howson (Honorary Member); and C. P. Hoover (Honorary Member)

vention of wasted water by units which do not utilize water conservation. When it comes to looking for sources of supply for air-conditioning units, must prospective users turn to the city water although well water is generally cooler? Private surface supplies are generally unavailable or not usable for several reasons, and well waters may often be too hard, or corrosive. Thus the city supply bears the brunt of installations. More than 90 per cent of present installations are attached to city mains.

Mr. Kain gave a number of figures on the consumption of water per ton of refrigeration (it varies from 1.5 to 3 gal. per ton) and presented statistics to show that more than 90 per cent of the installed capacity to date does not employ water conservation. There are several types of condensing systems, and in some cities restrictions are placed on the maximum size of installation that can be installed without the use of water conservation equipment.

Mr. Kain, who believes that homes will be air conditioned within the next five years or so, said that rates for water used for air conditioning should be paid for under the regular water rates. In closing, Mr. Kain recommended that the A.W.W.A. select a committee to draw up a policy outline in reference to ways and means for coping with the problems attendant to the growing installations of air conditioning.

Next speaker on the panel discussion was ELWOOD BEAN, Prin. Asst. Engr., Bureau of Water, Philadelphia, Penna. Mr. Bean said that in a study of 56 water utilities, only 25 per cent had sufficient supply. These 56 utilities may probably be representative of the majority of the water supplies in the country and these appear to be divided into four groups: Those worrying daily about sufficiency of the supply; those looking for additional supply; those with plenty of water for present uses; and those which have more water than needed and are really looking for sales.

The installation of air conditioning units will greatly affect the water utilities in all four of these classes. And the effect will be worse if the air conditioning units are installed without water conservation facilities. The extent to which this could be projected is illustrated by the example of Chicago. Mr. Bean said that if Chicago were completely equipped with air conditioning *without* water conservation, the water *wasted* would be 297 mgd., whereas the main capacity is only 240 mgd. and this is practically demanded under current water usage. In New York City present wastage is estimated at 3 per cent, and in Chicago wastage is estimated at 7 per cent. Compare these figures with what would go down the sewer in case of complete air conditioning of Chicago, for example.

At the present time only three cities have limitations on the size of unit that can be installed without water conservation. Even where the limit on size of non-conservation units is set at 2 gal. per min., the total water waste can run into appreciable figures in a large city. Furthermore, this sort of limit does not prevent peak loading which may exert an extra demand greater than the capacity of the facilities.

Mr. Bean is convinced that water used for air conditioning must be metered, and he thinks that it is possible to estimate the use for any particular unit or building contemplating installation. Therefore it should be possible to set up rates for water so used.

LYNN B. MISHELL, Carrier Corp., Philadelphia, Penna., discussed peak load use of air conditioning units and explained the operation of different types of units and condensers. These include air cooled units under three ton capacity; water cooled shell and tubes which require the least floor space and are the cheapest; and the recovery condenser systems.

The latter include the natural draft cooling tower; the evaporative condenser, water spray, etc. Evaporation from a coil surface uses less space, has less water loss, and operates at a lower cost. Mr. Mighell presented two charts, the first of which shows that the annual owning and operating costs are less for water cooled units of less than 15 tons capacity but above that size the operating and owning costs are less for evaporative units. The annual water cost for the evaporative units goes up but slightly as the size of the unit increases while the annual water costs rise almost proportionately with the size of the units for water cooled units.

Chart No. 2, based only on operating costs, presented a method for determining the proper condensing temperature for different waters at different power rates. As the costs of water go higher even though the costs of power go lower there is need for water conservation to make operating of air conditioning units economically feasible.

At this point in the proceedings, Mr. Amsbary interjected his own experiences in Urbana-Champaign, Ill. This water supply is from wells at a temperature of 54 deg. and reaches the consumer at 58 deg. At this temperature it is cheaper for the consumer to throw the water away than to install conservation. If conservation were installed, 95 per cent of the water used could be saved. The Illinois Commerce Commission made it possible for the utility to set up a surcharge, but it was still cheaper for the user to throw the water away than to install conservation. Furthermore, the increased operating costs to the utility would not carry the increased operating and fixed charges necessary to supply that extra water. What to do? Either revise the surcharge or alter the rules regarding installation of air conditioning. It was decided to cancel the surcharge and adopt a new rule that all units below 1½ tons must be air cooled.

Mr. Amsbary sent out a questionnaire and received 41 replies on the subject of air conditioning. A few of the cities have regulations, some restrict the discharge of water to the sewer; only one, in Arizona, was not interested in air conditioning restrictions.

Final speaker on the panel was MARSDEN C. SMITH, Chief Engineer, Dept. of Public Works, Richmond, Va. Mr. Smith says there are other problems of peak load besides those of air conditioning, for example, sprinkling. In short, intense, summer seasons the problem is different than in the semi-tropical areas.

Americans object to high charges and to regulations; they therefore object to restrictions on air conditioning, because of peak demands when sprinkling is allowed without restriction. Discrimination is undesirable and Mr. Smith is opposed to restrictions on the use of water. He would set the limit for non-conservation air conditioning units at 5 ton capacity.

Mr. Smith cited several examples of unreasonable use of water and told how the difficulties were worked out. The exercise of good public relations is a great help in problems of this kind. As to the rate to be charged, Mr. Smith suggested that it should be sufficient to pay for installation and operation of the water utility.

In the floor discussion which followed, MELVIN P. HATCHER, Director, Div. of Water, Kansas City, Mo., said that rules work better when they are "installed" ahead of action by the customer. Kansas City has had its problem with too many large installations with no restrictions.

Mr. Hatcher believes that to refer the question to a committee will be too slow. He had hoped that the panel discussion would arrive at some statement of policy, and suggested that a similar panel next year should develop a statement of policy. He spoke of the need for a load factor study of maximum hourly or daily demand versus yearly demand over the whole country.

L. R. Howson, Con. Engr., Chicago, said that there was no A.W.W.A. committee now at work on this matter of air conditioning but he believed that one should go to work soon, and that the directors would undoubtedly consider it.

T. H. Kain, who had appeared on the panel, pointed out that he had recommended the formation of such a committee just four years ago and that he was glad to hear that it might soon come to pass.

not delayed. He wanted to draw up a statement of policy now and revise it later.

Lou Smith, Supt. of Water, Rochester, N. Y., said that his city was reaching its supply capacity and will soon pass it if air conditioning without conservation is allowed to go unchecked. His city council wants to pass a rule about water conservation. What should the restriction be? Five tons? Or should it be a certain gallonage per hour?

W. Victor Weir, Pres., St. Louis County Water Co., suggests that the Carrier Corp. chart should be revised to cover different water rates as well as different electric rates. He also suggested that a commercial rate be set up for air conditioning water consumption.

The audience voted to ask the Board of Directors of A.W.W.A. to take action on establishing a committee on Air Conditioning. Mr. Amsbary suggested that any one in the audience having a question should mail them to either Mr. Amsbary or Mr. Marsden C. Smith.

Water Conservation in New Jersey

Roswell M. Roper, Engr. & Gen. Mgr. Board of Water Comm., East Orange, N.J., is Chairman of the Water Policy Commission, of the New Jersey State Conservation Department. He spoke on "Water Conservation and Regulations in New Jersey." Mr. Roper reviewed the geology of New Jersey and its relation to water resources. It was many years before there was any control of water resources in New Jersey in spite of the increasing population and demand for water. Then came the Water Policy Commission with its control over potable waters. More recently, a result of action by the N.J. Section of A.W.W.A. a state law was passed to give control over industrial waters as well. Now studies are in progress to collect data to determine the best course of action to conserve the water resources of the State of New Jersey.

(The second and concluding installment of the report on the A.W.W.A. will appear in the July issue.)

Some of the 1000 Diners at the Annual Banquet

Paul Weir, Gen. Mgr., Atlanta Water Dept., Atlanta, Ga., called attention to the growing industry of air conditioning and asked that the work of the A.W.W.A. committee be

University of Missouri Offers Sanitary Engineering

The University of Missouri has developed graduate work in sanitary and public health engineering. New classes in engineering and in other departments of the University have been established to meet the requirements. An undergraduate Sanitary Option in the Civil Engineering Department has been developed to lead to the graduate program.

The work will be done under the immediate direction of Prof. Lindon J. Murphy, M.S. and C.E. in Sanitary Engineering from Iowa State and formerly Lt. Colonel in the U. S. Public Health Service, and Mr. Scott Johnson, M.S. in Sanitary Engineering from Harvard, Chief Engineer of the Missouri State Board of Health.

For further information communicate with Harry A. Curtis, Dean, College of Engineering, University of Missouri, Columbia, Mo.

S. Logan Kerr Moves Office

S. Logan Kerr, consulting engineer of Philadelphia, has moved his office and is now located at Room 514, 1528 Walnut St., Philadelphia 2, Pa.

At the recent A.W.W.A. convention in Atlantic City, Mr. Kerr read a paper on water hammer.

W .L. Lea Joins Wisconsin Sanitary Laboratory

The Sanitary Laboratory of the University of Wisconsin has added to its staff, in charge of chemistry, Dr. William L. Lea. Dr. Lea served at one time for six years as assistant chemist in the State Laboratory of Hygiene at Madison, Wisc. For seven years he was with the Industrial Hygiene Division of the Wisconsin State Board of Health.

Dr. Lea is particularly well known for his research work on B.O.D. dilution water and the development of the Lea-Nichols supplemented dilution water.

Correction
Use of Reynolds Number—April Issue

The lead article in the April 1948 issue, prepared by Charles H. Capen, Chief Engineer North Jersey Water Supply Commission, Wanaque, N.J., discussed the use of the Reynolds number in pipe flow. Mr. Capen has called our attention to the fact that Fig. 4 lacks an ordinate designation on the Y-axis of the graph. A check of the original graph shows that the Y-axis should be "one over the square root of "f" or $\frac{1}{\sqrt{f}}$

Unfortunately when the engraver prepared the cut of this particular figure, that designation on the Y-axis was omitted. **"f"** is the Darcy-Weisbach resistance coefficient and the figure shows the loss of carrying capacity of the Wanaque line as plotted against the age of pipe in years.

CUBIC FEET, GALLONS, POUNDS, AND TONS OF WATER IN RECTANGULAR TANKS*

THIS chart will be found useful for rectangular tank determinations. The dimensions of the tank, all in inches, are given in columns A, C, and D. Then, as will be noted, you can find the number of cubic feet in column E, the gallons in column F, the pounds of water in column G, and the tons of water in column H. As a typical example, let us say that the width of a given tank is 10 inches, the depth 5 inches, and the length 20 inches. How many pounds of water will the tank hold?

How to Use the Chart

Find the 10 in column A and run a straight line over to the 5 in column C and locate the intersection with column B. Then from that point of intersection run over to the 20 in column D, and note the intersection with column C. It will be observed now that column C and J are exactly alike so that perfectly horizontal lines can be drawn between those two columns. In this instance the intersection in column C happens to be through the 10, so simply run a straight line through the 10 in column C and the 10 in column J, as shown by the dotted line, and you have a perfectly horizontal line which gives all of the answers as follows:

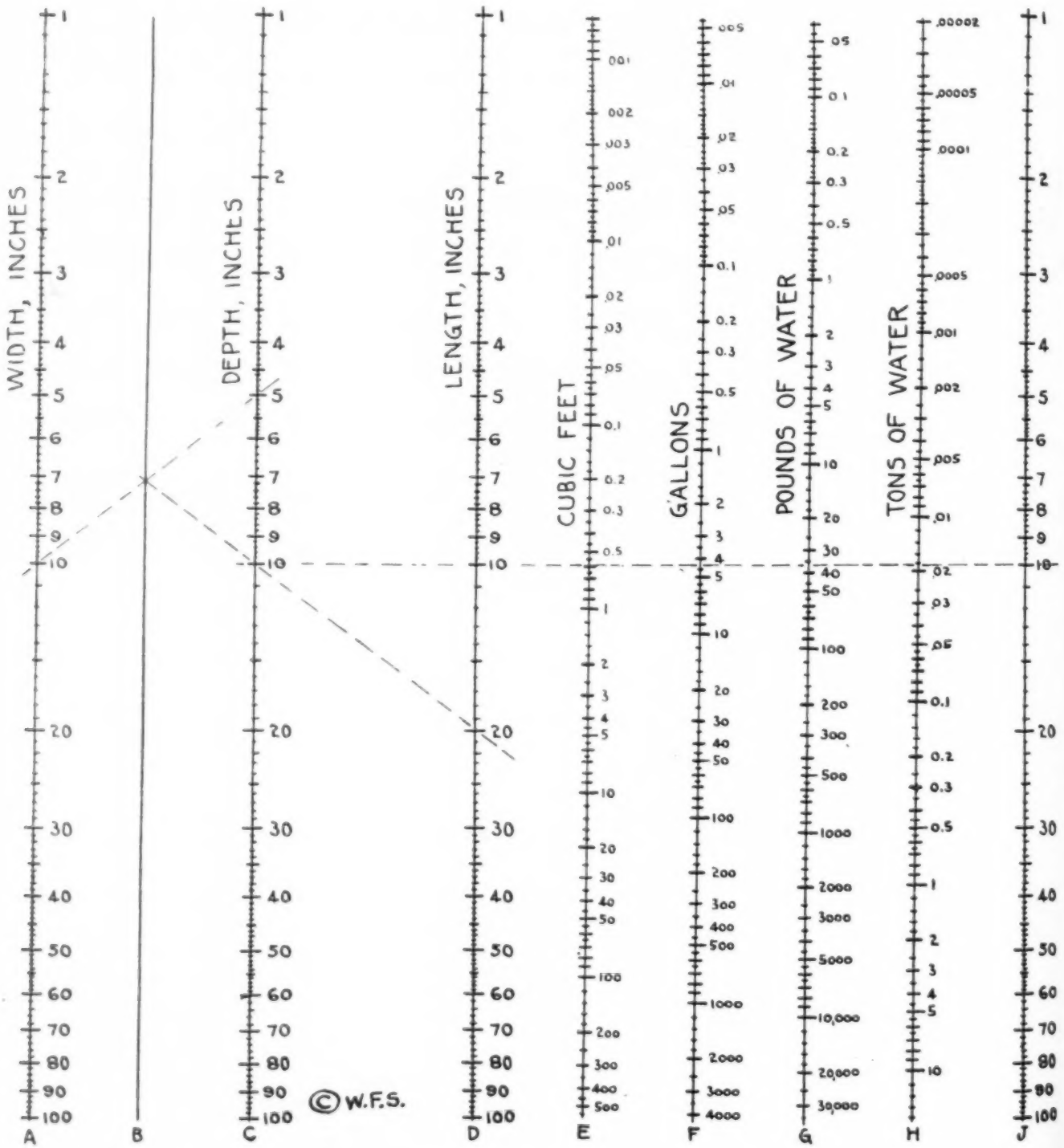
Column E shows that the tank has a volume of nearly 0.6 cu. ft.

Column F shows that the number of gallons is about 4.3.

Column G shows that if the tank contains water the weight will be about 37 pounds.

Column H shows that the number of tons of water is approximately .0185.

*Contributed by W. F. Schaphorst, M.E., Newark, N. J.



THE CHEMISTRY OF WATER TREATMENT*

Part II. Softening

by
A. P. BLACK
Professor of Chemistry
UNIVERSITY OF FLORIDA
GAINESVILLE, FLA.

THE past few years have witnessed a large increase in the production of softened water. There are two main reasons for this increase. In the first place, new industrial processes have created a demand for large volumes of soft water. In the second place, there is an increased appreciation on the part of the average domestic consumer of both the aesthetic advantages and the economic savings resulting from the use of soft water. The result has been that whereas a few years ago water softening was practiced very largely only in so-called "hard water" areas, it has now spread to all portions of this country and throughout most of the world.

The Author

LIME-SODA PROCESS

There are two main processes employed for the softening of water. The first is the lime or lime-soda process and the second is the zeolite process. They will be discussed in the order named, but before discussing the chemistry of water softening, it is necessary to pause for a moment to consider the types of hardness present in natural waters. In the first place, hardness in water is due to its content of calcium and magnesium. It is rare that any other ion is present in sufficient quantities to be seriously considered in softening calculations or practice. The calcium and magnesium salts are present in one or more several forms. When present as bicarbonates or normal carbonates, the hardness so resulting is called carbonate hardness. When present in the form of sulphates, chlorides, or nitrates, the hardness so resulting is called non-carbonate hardness. As we shall see, each type hardness requires a different treatment for its removal.

The equations listed above show all the reactions which take place in softening a water containing both carbonate and non-carbonate hardness by the lime-soda process. It will be noted in equation 1 that carbon dioxide is shown being removed by lime. It should be noted that carbon dioxide is not considered to be hardness in water but when present it will consume lime in direct ratio to the carbon dioxide content and since it must be considered in calculating the cost of softening and the chemical dosages required, it is shown first among the softening reactions.

Equations 2, 3 and 4 show the removal of carbonate hardness by lime. It will be noted that whereas only one molecule of lime is required for each molecule of calcium alkalinity, two molecules of lime are required for each molecule of magnesium alkalinity. It follows, therefore, that high magnesium waters require a higher dosage of chemicals than waters low in this element. Equation 5 shows the removal of the magnesium non-carbonate hardness by lime. It will be noted that no softening is effected by this equation since for each molecule of magnesium salt present an equivalent amount of calcium salt is formed.

Equations 6 and 7 show the removal of non-carbonate hardness by soda ash. The equations are identical but are written twice since equation 6 shows the removal of calcium sulphate formed in equation 5 and equation 7 shows the removal of calcium sulphate originally present in the water. From these reactions it will be noted that an equation to be used in calculating the dosage of lime necessary to soften a given water should contain three terms, one for carbon dioxide, one for carbonate hardness and one for magnesium.

*Condensed from a series of lectures given at the short school for water and sewage works operators offered jointly by the Georgia State Board of Health and the Georgia Institute of Technology, Atlanta, Georgia, in September, 1947.

Reactions in Lime-Soda Process

1. $CO_2 + Ca(OH)_2 = CaCO_3 + H_2O$
2. $Ca(HCO_3)_2 + Ca(OH)_2 = 2CaCO_3 + 2H_2O$
3. $Mg(HCO_3)_2 + Ca(OH)_2 = CaCO_3 + MgCO_3 + 2H_2O$
4. $MgCO_3 + Ca(OH)_2 = Mg(OH)_2 + CaCO_3$
5. $MgSO_4 + Ca(OH)_2 = Mg(OH)_2 + CaSO_4$
6. $CaSO_4 + Na_2CO_3 = CaCO_3 + Na_2SO_4$
7. $CaSO_4 + Na_2CO_3 = CaCO_3 + Na_2SO_4$

Calculation of Lime Dosage

1. Ppm. 100% CaO = (CO_2 + carbonate hardness + magnesium) × .56
2. Ppm. 90% CaO = (CO_2 + carbonate hardness + magnesium) × .62
3. Ppm. 100% $Ca(OH)_2$ = (CO_2 + carbonate hardness + magnesium) × .74
4. Ppm. 90% $Ca(OH)_2$ = (CO_2 + carbonate hardness + magnesium) × .82

Calculation of Soda Ash Dosage

5. Ppm. 58% light soda ash = (non-carbonate hardness — X) × 1.06

Many types of equations have been proposed and employed for calculating the dosages of lime and soda ash required for softening a given water. Those shown above are simple and have the advantage of referring back directly to the equations which have just been given. Equations 1 and 3

are of theoretical interest only since it is not possible to purchase 100 per cent pure calcium oxide or calcium hydroxide but they are shown since that clearly indicates the source of the equations themselves.

In using the equations, carbon dioxide, carbonate hardness and magnesium must all be expressed in terms of calcium carbonate. This means that the carbon dioxide content in parts per million, determined as such, should be multiplied by 2.28 and the magnesium content in parts per million, determined as such, should be multiplied by 4.11. The carbonate hardness will have already been determined and expressed in terms of calcium carbonate. The figure .56 is the molecular weight of calcium oxide expressed as a percentage and the equation shows that it requires only 56 per cent by weight of pure calcium oxide to remove a given weight of the constituents included in the equation when they are expressed as calcium carbonate.

In equation 2 the figure .62 is merely a factor corrected for the purity of commercial quicklime and where large shipments are involved and accurate analyses are available, the actual figure obtained by analysis should be used in place of that given. In the same way, in equation 3 the figure of .74 is the molecular weight of hydrated lime expressed in per cent and the equation shows that 74 per cent by weight of 100 per cent pure hydrated lime will remove a given quantity of the constituents shown in the equation. The figure .82 in equation 4 is a correction based upon hydrated lime containing 90 per cent $Ca(OH)_2$. Here again actual percentages should be used if available.

These equations are capable of numerous modifications since it may not be necessary or desirable to remove all of the carbonate hardness or all of the magnesium. In recent years so-called selective softening has assumed considerable importance, the term indicating only the removal of calcium hardness, all of the magnesium hardness being allowed to remain in the water except a small percentage brought down by occlusion in the calcium carbonate sludge.

Equation 5 provides a method for calculating the dosage of soda ash required to remove non-carbonate hardness. The "X" in the parentheses stands for the carbonate hardness which may be allowed to remain in the softened water and still yield a final treated water of the desired total hardness. For example, if it is desired to soften a given water so as to have a total hardness of 85 parts per million and the alkalinity of the softened water is found to be 40 parts per million, then 45 parts per million of non-carbonate hardness may be allowed to remain in the water and in such cases X = 45 ppm. When the first four equations are compared with equation 5 it will be noted that whereas the amount of lime required to remove a given amount of carbonate hardness is substantially less than the weight of carbonate hardness removed, in the case of non-carbonate hardness the weight of soda ash required to remove a given amount of hardness is about 6 per cent greater than the weight of hardness removed. The figure 1.06 is the molecular weight of pure sodium carbonate expressed in per cent and no corrected equation is necessary since 58 per cent light soda ash is about 99 per cent pure sodium carbonate.

The equations indicate, therefore, that it is more economical to soften waters of low magnesium hardness than waters of high magnesium hardness and it is likewise more economical to remove carbonate hardness than non-carbonate hardness since the cost of lime in either form is very much less than the cost of soda ash. Having calculated the dosage of lime and soda ash required in parts per million, it is only necessary to convert to pounds per million gallons and multiply by unit cost to secure the figure for the cost of softening per million gallons.

Chemicals Employed

Lime is used in one of two forms, hydrated lime or quicklime. Hydrated lime is usually shipped in fifty-pound paper bags as a finely ground powder and is most suitable for use in small plants because of its ease of handling and feeding. Quicklime, on the other hand, may be shipped in bags, barrels or drums, but is usually shipped in bulk cars and must be stored under carefully controlled conditions. It must be slaked and fed by special slaker-feeders.

Slaking is usually carried on at a temperature of 150 degrees F. to 165 degrees F. and the hot milk of lime resulting from the slaking process is delivered to the softening basins. Soda ash is usually shipped in one hundred-pound paper bags and the material known technically as "58% light soda ash" should be specified. The Committee on Specifications for Water Purification Chemicals has in preparation complete specifications covering each of these materials and these specifications will soon be available to the profession.

Since a part of the sludge formed in the softening operation is of such particle size as to approach the colloidal state and settles with difficulty, if at all, it is usual practice to employ a small amount of some suitable coagulant in connection with lime or lime-soda softening. For this purpose alum or a ferric salt may be employed and usually a dosage of 0.5 grains per gallon or even less is satisfactory.

The last three or four years have witnessed the widespread use of "activated silica" as a coagulant in a lime or lime-soda softener. Sodium silicate activated with ammonium sulphate was first used for this purpose in Fort Lauderdale, Fla., nearly five years ago, replacing 4 grains per gallon of alum and effecting very substantial savings. There are at the present time in operation in Florida a number of softening plants employing activated silica as the only coagulant and the new 80 mgd. softening plant of the City of Miami is being designed for the use of sodium silicate activated with carbon dioxide as the coagulant.

This material has proved amazingly effective, particularly in the case of waters high in calcium and low in magnesium. The Miami water supply contains approximately 100 parts per million of calcium ion and only 4 parts per million of magnesium. Dosages of alum as high as 3 grains per gallon have little effect on settling softened water where as little as 2 parts per million or ⅛ grain per gallon of activated silica allow a settled water going to the filters having a turbidity of approximately 5 parts per million. Although activated silica was originally suggested by Baylis as a coagulant aid, it is suggested by the writer that the multiplying cases where the material is used as the only coagulant now make it possible to designate it as a true coagulant in every sense of the word. There is not time in this brief paper to go into the possible mechanism of its action except to say that it is not as yet completely understood and that conflicting theories still prevail.

Mechanical Equipment Used

In the early days of lime softening, "fill-and-draw" plants were common and three such plants were constructed in the State of Florida. They consisted simply of basins which were filled with water, chemicals added, the mixture of water and chemicals mixed with compressed air from forty-five minutes to one hour, and then the softened water allowed to settle for 12 to 18 hours. The clear settled water was then pumped to surface without filtration or stabilization. Two of the three Florida plants of this type have been abandoned and the third has been modernized and converted to more efficient operation.

The next development consisted in the use of separate mixing basins followed by some type of clarifier or mechanical settling unit. The mixing basins are equipped with one of a number of different types of mixing equipment and in many plants facilities are provided for the return of sludge. Water from the mixing basins passes to the clarifier where the settled water flows over collection weirs to recarbonation basins and filters and the sludge is pumped from the bottom of the unit, either continuously or at intervals as desired. These units have obvious advantages over the old type plants.

Recent years have witnessed the introduction of several types of "high rate" units so-called because the rate of flow through the units is far in excess of values employed in the older type units. Values for rate of rise of water in excess of two gallons per square foot per minute of effective basin area are now common so that it is possible to soften water in units which have an effective settling area less than the area required for the rapid sand filters, assuming that the conventional filter rate of two gallons per square foot per minute is employed. This is neither the time nor the place to introduce a discussion of the relative advantages and disadvantages of the various types of units available, but it is believed that the statement may be made that, in general, they represent a substantial improvement over old type equipment.

Limits of Softening

The theoretical limit of softening by the lime-soda softening process is, of course, the solubility of the resulting precipitates at the temperature employed. This value in case of a water containing both calcium and magnesium hardness, and assuming a dosage for the "complete" removal of both, is 25 parts per million but it is rarely, if ever, attained in cold lime-soda softening. In low magnesium waters it is readily possible to secure final alkalinities of 33-35 parts per million but as the magnesium content of the raw water increases, the alkalinity of the final effluent is apt to increase also, unless a considerable excess of lime is employed.

The economic limit of softening is, of course, set by the use to which the water is to be put. Since only a very small fraction of the water produced by a municipal water treatment plant is used for those purposes where hardness is a factor, it is obvious that there is a very definite limit of softening beyond which the economies effected will not pay for the additional cost. For many years it has been generally understood that this figure is approximately 85 parts per million; however, with the widespread increased use of domestic hot water systems, and the great increase in the price of soap, it is necessary in each individual case to re-evaluate this figure in the light of existing conditions and there appears to be a tendency toward softening municipal water supplies to a total hardness lower than 85 parts per million.

In the case of industrial waters, of course, the degree to which the water is softened will be set by the use to which it is to be put. For boiler use, hot process softening is very commonly employed. The theoretical basis for hot process softening results from the fact that the precipitates of calcium carbonate and magnesium hydroxide become less soluble with increasing water temperature. By softening at a temperature of approximately 200 degrees F. it is possible to reduce the hardness of the treated water to 7-10 parts per million. In connection with hot process softening, the use of dolomitic lime, magnesium sulphate or ferric sulphate also results in reducing soluble silica to very low values. This modification is being increasingly used in cases of waters to be used in high pressure boilers.

Sludge Disposal

The disposal of the sludge produced in softening plants may often present a problem. Where it is possible to transport the sludge in liquid form to an adjacent river or lake or an area of low ground to be filled, the problem is relatively simple. If, however, the plant is located in a built-up residential or industrial area, the problem is more difficult. Attention is more and more being given to the possibility of calcining water softening sludges to recover the lime. Where waters free from turbidity and low in magnesium are being softened this process has attractive possibilities, and Pedersen's work at Marshalltown, Iowa, is well worth studying. At Miami, Fla., there has just been completed the first large rotary calcining plant to handle water treatment sludges in this country and the second in the world. The plant, which is expected to go under operation late this year, has a capacity of 28,000 tons of quicklime per year.

ZEOLITE SOFTENING

The zeolite method of water softening takes advantage of the remarkable property of certain naturally occurring alumino—silicates for base exchange, that is, these materials have the property of reversibly exchanging bivalent materials such as calcium, magnesium and iron for monovalent elements and ions such as sodium, potassium, and ammonium. The most common of these is the mineral glauconite, commonly called "green sand." The reactions of a natural green sand employing the sodium cycle are:

$$1.\ 2\ NaZ + Ca(HCO_3)_2 = CaZ_2 + 2\ NaHCO_3$$
$$2.\ 2\ NaZ + CaCl_2 = CaZ_2 + 2\ NaCl$$

The first reaction shows the removal of calcium bicarbonate or carbonate hardness by sodium zeolite and the second reaction the removal of calcium chloride or non-carbonate hardness by sodium zeolite. In each case the corresponding sodium salt appears in the treated water. Two factors are thus evident with respect to this cycle. The first is that since sodium bicarbonate will behave toward N/50 sulfuric acid exactly as will calcium bicarbonate, the alkalinity of zeolite softened water is unchanged. The second fact is that there is always an increase in the total dissolved solids of zeolite softened water since the two sodium ions weigh somewhat more than the calcium ion which they replace. In the case of high magnesium waters this increase in total solids is more pronounced since the weight of the sodium ion is almost double that of the magnesium ion which they replace.

In addition to natural green sands, several other types of zeolites are available. Natural green sand may be specially processed, resulting in a product usually known as "high capacity green sand." Zeolites may be made synthetically by either a wet or dry process and yield siliceous materials having all the properties of natural green sands but to a considerably greater degree as their exchange capacity is substantially higher than the natural products. Other types of zeolites in common use include the carbonaceous zeolites and the resin type zeolites. Carbonaceous zeolites may be made to function either as sodium zeolites or as hydrogen zeolites. In latter case, the reactions are:

$$3.\ 2\ HZ + Ca(HCO_3)_2 = CaZ_2 + 2\ H_2O + 2\ CO_2$$
$$4.\ 2\ HZ + CaCl_2 = CaZ_2 + 2\ HCl$$

Here the calcium is replaced by hydrogen yielding, in the case of the bicarbonate ion, carbon dioxide and water, and in the case of calcium chloride or calcium sulphate, hydro-

chloric acid or sulfuric acid. Since carbon dioxide may be removed by aeration, hydrogen zeolites may be used to remove the alkalinity from water and substantially reduce the total solids. Since the free mineral acids produced by reaction of chlorides and sulphates with the minerals would be very corrosive, it is necessary either to add alkali to the treated water or, most usually, to bypass water containing sufficient natural alkalinity to neutralize the mineral acids formed in the fraction softened. These reactions are frequently made use of in boiler water.

Certain resinous types of zeolite have been developed which will completely absorb the mineral acids formed in the hydrogen cycle. Obviously, therefore, by first by-passing water through a hydrogen zeolite followed by passage of the same water through a resin type zeolite, all total solids except silica will be removed and a product which is essentially distilled water will be obtained. Recently, synthetic zeolites have been developed which will either remove silica completely or reduce it to very low values. The process is called "demineralization" and is being increasingly used by industry.

Regeneration of Zeolites

When the exchange capacity of a zeolite has been exhausted it is regenerated by use of salt brine in the case of sodium zeolite, of sulfuric acid in the case of hydrogen zeolite, and by sodium carbonate in the case of resinous zeolites which have been used to remove acids. The reactions are shown below:

5. $CaZ_2 + 2\ NaCl = CaCl_2 + 2\ NaZ$
6. $CaZ_2 + H_2SO_4 = CaSO_4 + 2\ HZ$
7. $Z \cdot H_2SO_4 + Na_2CO_3 = Z + Na_2SO_4 + H_2O + CO_2$

The cost of softening water by any of these processes will obviously be the cost of the regenerating material necessary to bring back the mineral to its original capacity after it has been used to soften a given volume of water. The exchange capacity of zeolites is ordinarily expressed in grains of hardness removed per cubic foot and materials in the same class may vary somewhat in their exchange capacity. The exchange capacity can also be influenced by the extent and method of regeneration. Natural green sands will usually remove about 3000 grains of hardness per cubic foot of mineral, high capacity green sands about 5000-5500 grains per cubic foot. Siliceous synthetic products have widely varying exchange capacities which depend upon the composition and method of manufacture. Their capacity usually varies between 6000 and 12,000 grains per cubic foot. In some cases, higher capacities are obtained, particularly for resinous types of zeolite.

Factors Affecting the Applicability of Zeolite Softening

There are several factors which affect the applicability of zeolite to the softening of water. In the first place, water passed through zeolite is softened to zero hardness and if a water of a specified hardness is desired, sufficient raw water must be bypassed to effect the desired result. Obviously, therefore, this process is not suitable for waters which contain turbidity, organic color or precipitated iron. Waters containing iron may sometimes be successfully handled by the zeolite process provided they are softened before aeration since the iron will be removed in the softening cycle. Special types of zeolites have been developed for the removal of iron and for other purposes but they cannot be discussed in the limitations of this paper.

Unless salt is available in bulk at moderate cost, the cost of softening water by the zeolite process usually exceeds that of the lime-soda process. The amount of salt required to regenerate zeolite mineral usually varies between 0.35 and 0.50 pounds of salt per 1000 grains of hardness removed.

Zeolite softening is far simpler from the standpoint of operation than is lime-soda softening and can readily be made completely automatic. For this reason it has been widely adopted for home softeners and for a great variety of industrial applications and there are a number of municipal zeolite softening plants in this country and abroad. Where natural brines are available either from the sea or from underground sources, the cost of zeolite softening is greatly reduced and zeolite softening with regeneration by natural brines will probably increase in the future in those areas where the process may be employed.

The most recent development in zeolite softening consists in the leasing to individual consumers of small portable units which are serviced and maintained constantly in operating condition by companies distributing such units. This development is spreading widely throughout the country and is attracting increasing favor, even in cities where municipal water softening plants are in successful operation since many people desire a water of zero hardness for household purposes.

Because of the versatility of the newer synthetic zeolites, many new and interesting applications are appearing yearly, not only in the field of water softening but also in the application of these materials to a wide variety of industrial processes, particularly the recovery of waste products where an exchange cycle may be employed. These may not be discussed here but those interested should consult some of the newer works on the subject.

In view of the steady increase in the number of municipal water softening plants, the comparatively low cost of individually owned home water softeners, and the rapid development of the industry supplying individually serviced softening units, it is quite evident that a larger and larger segment of the American population will enjoy the aesthetic and economic benefits accruing from the use of soft water as the years pass.

Louisville Constructing Large Pumping Plant

Designed by Alvord, Burdick and Howson, and installed by the Dravo Corporation, Pittsburgh, Pa., the new Louisville, Ky., water pumping system will cost approximately $800,000. This electrically driven pumping* system will replace the steam-driven equipment which has supplied water to the city in the past. The equipment, now under construction at the G-E Schenectady Works, will include six electric motors of the synchronous type, largest of which is rated at 2500 hp. This motor will operate at the riverside station pumping 60 mgd. water directly from the Ohio River to a water treatment station 1¼ miles distant. Five other electrically driven pumps will relay water through the distribution system or pump it 14 miles to a booster pump which will feed Louisville's Cardinal Hill Reservoir.

Arthur Weston Addresses National Health Assembly

Among the several speakers at the General Sessions of the National Health Assembly, held in Washington, May 1 to 4, was Arthur D. Weston, Director of Sanitary Engineering, Massachusetts Dept. of Public Health of Boston. Mr. Weston spoke on a National Program of Environmental Sanitation.

"KNOW YOUR VALVES & HYDRANTS"*

Some Comments on Valve and Hydrant Maintenance

by

A. G. SCHEINERT, Dist. Mgr.
Rensselaer Valve Co.
PITTSBURGH, PA.

The Author

I WELCOME this opportunity to discuss valves and hydrants with you and hope in some manner it will benefit the larger as well as the smaller water works superintendents and engineers to understand their valves and hydrants a little better.

Let's start with the gate-valve and ask ourselves what it is, as well as what role it plays in our everyday life. Here is what Webster has to say about a Gate Valve—"A valve which opens the full area of a pipe—on the principle of a gate in a water flume." To you water works men, however, I am sure it means much more, as it is the only means that you depend upon to control your water works system.

Since all water works systems use gate valves—either the double disc or wedge type—I intend this paper to deal mostly with the double disc type, which is used by most water works. A double disc gate valve consists of a cast iron body having straightway passages the full diameter of the connecting pipe. It has two cast iron discs, with bronze gate rings, which are parallel to bronze seat rings in the valve body. The raising, lowering and wedging of the gates (discs) is usually accomplished by the use of a bronze stem, stem nut and wedges. These parts are enclosed in the valve body by the use of a cast iron cover, stuffing box and follower, which are securely held in place by bolts and nuts. The means of operation can be accomplished with either handwheel, hub nut, hydraulic cylinder or electric motor. It is desirable on valves 16 in. and larger, when operated by hand, to employ the use of spur or bevel gearing so as to increase the leverage to open or close. In addition to the gearing the large valves should also be equipped with a valved bypass on the side of the valve body to permit the passage of water from the closed side of the valve to fill that portion of the pipe line that had been drained, thereby equalizing the line pressure before opening the large valve. To endeavor to operate valves of such size under high pressures would be an almost impossible task without the aid of these accessories, especially if the line pressure is on one side of the gate and zero pressure on the other side.

To fully appreciate the amount of leverage required to raise and lower the valve gate under an unbalanced pressure, you have only to take the square inch area of disc and multiply it by the pressure per square inch in the water main. You will find that the number of tons of pressure pushing against the gate is amazing.

Gate valves are manufactured with different types of end connections such as hub ends for bell and spigot pipe; flanged ends for flanged end pipe; screw ends for threaded pipe; and special ends for Universal C.I. and Transite pipe. There are also Dresser ends for plain end cast iron or steel pipe.

Operating Gate Valves

There are many factors to be taken into consideration when opening and closing gate valves in a water works system if damage to valves or pipe lines is to be avoided.

Gate valves of 2 in. size and smaller can be operated almost any way without causing damage to water lines. In closing larger valves by hand, the continuous process can be used when possible without causing any damage. This is due to the slow action of a gate valve. With a hydraulically operated valve, the speed of opening and closing must be controlled by the use of a throttle valve in the pressure water supply line to the cylinder. Motor operated valves are set to the proper speed of operation by the manufacturer. When large valves are once shut off, extreme care should be taken in opening them—especially if the system on the closed side of the valves has been drained. The proper procedure in the case of a valve without bypass is to raise the gates to a point where the seal is broken, thereby permitting the water to enter and build up pressure on the empty line slowly. There should also be an open connection in the line being filled such as an open fire hydrant, a blowoff or air release valve to permit the air in the empty line to escape. This procedure should continue until such time as the water discharges from the opening, indicating that the line is filled. All open connections should then be turned off allowing the pressure to build up. Only then is it safe to fully open the gate valve. Should the valve be equipped with a bypass, that, of course, is used for line filling before the large valve is opened at all.

In closing large valves when a break in the line occurs, the proper procedure is to shut off the valve nearest the break. Often times the up-stream line pressure is so great that it is impossible to close this valve against the unbalanced pressure. In such a case the bypass is again put into use to help equalize the pressure. In many cases, this will relieve the up-stream pressure sufficiently to permit closing the valve tightly. If it doesn't, close the bypass and go back to the next valve in the line and close it as far as it will go without straining the working parts. This will usually choke the flow of water in the line to a point where the bypass on the first valve will sufficiently relieve the pressure against the gates to permit their closing to a tight seat. Once this is accomplished the bypass can then be closed and the second valve opened. The procedure of opening the first valve after the repair has been made should be as previously explained.

The life of a gate valve from a manufacturer's standpoint is considered 50 years. However, most gate valves wil give good service for a much longer period, depending upon the care they receive and the sort of people that operate them. It is not within reason to expect a valve to operate like new after it has been installed for many years without being

*A paper presented before the W. Va. Section of A.W.W.A. and released by the Association for publication in *Water & Sewage Works*.

operated. We all know that water is somewhat corrosive by nature and that the working parts will corrode to a point where it is almost impossible to move the gates. In such a case it is usually necessary to operate the gates up and down several times before a tight shut off can be made. It is for that reason that most water works superintendents and engineers prefer the parallel seat disc type valve in which the gate rings move on the seat rings like a pair of scissors and thus shear off any foreign substances adhering to them. The gate discs moving independent of each other break away the corrosion that builds up inside, permitting the gates to seat on clean surfaces. This type of valve is, therefore, referred to as a self cleaning valve. Even so it is not the answer to quick shut downs.

Valve Inspections

The time in closing a valve is a very important factor in case of an emergency. In view of this, I believe that most water works superintendents and engineers are thinking more and more of routine valve surveys or inspections. I have been asked by several superintendents lately how often they should inspect their valves. My answer to this has been—at least once a year and the very important ones twice a year. This inspection should not only consist of opening and closing the valves, but should include all data pertaining to the make and size of the valve, the direction of opening, the number of turns to open and close, whether the valve operates hard or normal, whether the valve box is placed squarely over the valve to permit easy access of the operating key to the hub nut, the location of the valve box or manhole from some permanent location on the street so that it can be quickly located in snow, or when the street department has accidentally covered up the valve box. This data, all recorded in permanent records in the water works office, as well as in some condensed form, carried by the foreman of the water works crew at all times.

Some Causes of Minor Troubles

I shall now discuss some of the causes of minor troubles with gate valves that have been brought to my attention by water works operators.

1. *Hard Working Valves:* It has been brought to my attention that even new valves sometimes work very hard. Upon inspection I found most of this trouble to be in the stuffing boxes. They had been bolted down too tight and the packing had frozen tight to the stems and it was almost impossible to turn them. The way I was taught to gauge the tightness of a packing gland was to back up on the stuffing box bolts to where the stuffing box would leak, then reverse the action until the leakage stopped. The gland as a rule is not very tight and a drop or two of water may appear on top of the gland while the valve is being operated but will soon disappear after the turning is stopped. By not having the follower bolted down too tightly allows space for the packing to expand without binding the stem. A precaution along this line —especially on valves placed in the distribution system and operated through a valve box—will eliminate considerable trouble and leaking stuffing boxes in time.

A very interesting story was related to me by one of my customers revealing how he had corrected a tight stuffing box which had prevented complete closure of the valve. His crew tried to shut off a 12 in. valve and after several attempts to close it had failed, they were on the verge of digging it up and taking it apart to see what the trouble was. Being close to their lunch hour, they decided to see what a little oil would do. He sent one of his men to a service station where he secured several gallons of oil drained from the crank cases of cars and poured this oil into the valve box. After lunch they returned and found that a sufficient amount of the oil had penetrated around the stem of the valve, had softened the packing and permitted closing of this valve. This one experience has led this water works utility to save their old oil drained from the crank cases of their trucks for such use in the future. This idea has now been adopted by neighboring water works utilities.

Last month when talking with another friend of mine, he stated that his company used an oil can with a long spout and saturated the top of the valve with penetrating oil to accomplish the same purpose. It is my belief, however, that it eventually would be a better plan to dig up these valves and repack them with a good grade of soft hemp packing soaked in tallow and impregnated with graphite.

2. *Ordering Repair Parts:* There are many times that we receive orders for repair parts when we cannot interpret what the customer means. This unfortunately results in delayed shipment of the desired parts and possibly a hardship. It is well, therefore, to carry a good stock of repair parts and also to keep an up-to-date file of catalogs on such material. If you do not have catalogs of your suppliers, don't fail to ask these firms to furnish you with an up-to-date copy of their catalogs. You may rest assured that your suppliers will welcome the opportunity to be of service in this respect, or in recommending the proper materials or equipment for your particular job. They will also be happy to learn if water or sewage works operators have any improvements to suggest or comments to offer on their material or equipment. Only in this way are your suppliers best able to undertake needed improvements and, thereby, give better service.

Only a short time ago it was recommended by one of my very good customers that serial numbers be placed on valves 16 in. and larger as one means of obtaining the proper parts for that particular valve. This constructive suggestion will without doubt bring results and prove of marked help to the valve manufacturers in supplying correct parts speedily for that particular valve when the valve number is given on the order form or sent over the wire.

FIRE HYDRANTS

Everyone in the community benefits either directly or indirectly from Fire Hydrants. Therefore, they must be considered an all important part of any water works system.

Fire hydrants are basically a type of valve, but differ materially from that of the gate valve. They are required, when opened, to deliver a large quantity of water from the distribution system for fire fighting purposes and when closed, to remain tightly closed until needed again. Since a portion of the hydrants extend above the ground level for accessibility it is necessary, therefore, that they be equipped with automatic drains allowing the water to drain out of the standpipe after the main valve has been closed.

Manufacturers building fire hydrants recognize these requirements, as well as the various other uses (and abuses) which hydrants are subject to, and have endeavored to produce a product that will meet these requirements.

It is to the advantage of anyone that purchases or maintains this type of equipment to select a hydrant that is rugged in construction, efficient in operation, has simplicity in design, and accessibility from the standpoint of repair. In addition it should possess a neat appearance that is pleasing to the eye and be kept so. Like gate valves, fire hydrants have a potential long life and this, again, is largely

dependent upon the men who operate and maintain them. I have been asked several times how often fire hydrants should be inspected. My answer to this has been twice a year. In the fall before winter sets in they should be inspected to determine if all can be operated, whether or not repacking of the stem is needed, also to insure that the barrel drain is working properly. Then in the spring a reinspection should be made to learn if any damage by freezing weather has been done. At this time hydrant repainting should be done where needed. Since fire hydrants should be inspected twice a year, a good stock of repair parts should always be kept on hand, as well as complete data from the manufacturer as to the best method of making hydrant repairs. I will not attempt to go into all the short cuts or "kinks" known in making hydrant repairs, due to the many types of hydrants in service. Instead, I will suggest that you call on representatives of the hydrant manufacturers who will be happy to explain these "kinks" and short cuts to you, as well as supply other information which will prove helpful in the repair and maintenance of the particular hydrants which are on your system.

Ed. Note: For two valuable articles on "Valve and Hydrant Maintenance" the reader is referred to our 1947 Reference & Data Number, pages R-84, and R-87.

Construction Increases

According to information released by the Office of Economic Research of the Federal Works Agency, construction of water supply facilities and sewage works systems during January and February of this year showed an increase over the past year.

Sewage works construction this year totalled $26,313,000 as compared with $18,709,000 for the same type of construction in January and February of 1947. Water supply facilities construction contracts awarded amounted to $17,300,000 in January and February of this year as compared to $13,616,000 during the same first two months of 1947.

"Lone Sentinel!"

After the recent unpleasantness which descended upon Bunker Hill, Ill., in the form of a bit of wind known as a tornado, which created the havoc here pictured and pretty much leveled everything in town, Bunker Hill's 60,000 gal. water tank on its 69 ft. tower stood out as the "Lone Sentinel"—still the guardian of the community's safety from fire and pestilence. This tank was erected by Chicago Bridge & Iron Co. in 1936.

Progress Report F.S.W.A. Research Grant in Aid Program

The Federation of Sewage Works Association has made its Semi-Annual Progress Report to the U.S. Public Health Service National Institute of Health on its Research Grant-in-Aid under direction of W. D. Hatfield for the Federation. This is a research project consisting of six parts designed to develop new and improved methods of analysis of sewage, industrial waste, and polluted waters.

The purpose of the proposed research was to assist in the accurate estimation of the extent of pollution of public water courses, to evaluate efficiencies of both natural and artificial purification processes, and to estimate organic and inorganic substances in industrial wastes which affect either natural or artificial purification.

At the Massachusetts Institute of Technology, Dept. of Civil Engineering, Dr. Clair N. Sawyer is studying nitrification in sewage treatment, and is developing primary standards for B.O.D. measurements, as well as studying the question of seeding material and the influence of bacteriophage.

At the Wisconsin State Laboratory of Hygiene, Dr. M. Starr Nichols has under way studies on the composition of dilution water, seeding, B.O.D. standards, effect of sodium Azide and dinitrophenol on B.O.D. and the viability of organisms in dilution water.

At the New York State Health Division Laboratories, F. W. Gilcreas and an assistant are working on the determination of grease in sewage. The present Standard Methods technic is under scrutiny as well as modifications of it, and modifications of the Gehm method, and the Eliassen and Schulhoff method. Studies will also be made of the wet extraction method of Pomeroy-Wakeman. To date it appears that none of the methods are suitable when precision and time required is used as the criteria of standards.

At Rutgers University, under the Direction of Willem Rudolfs, Biochemical Oxygen Demand experiments are being carried on, with studies being made on the adaptability of the direct oxygen utilization method.

At the University of Illinois, State Water Survey Division, under the direction of A. M. Buswell, the nitrification phase of the B.O.D. test is receiving study. The possibility of using isotopes to trace the reaction is under consideration.

Under the direction of Gladys Swope and R. D. Hoak the Allegheny County Sanitary Authority Laboratory is making studies on the determination of metallic ions usually found in industrial wastes. Methods for copper, chromium and cyanide are under investigation at the present time. Zinc and cadmium will also be studied.

Because of the lateness with which some of these laboratories were able to start their work the Progress Report is quite preliminary.

Officers of the Association

(1)—R. T. Gardner, Sewage Federation Bd. of Control. (2)—W. Brinkerhoff, Director. (3)—H. W. Yost, Immediate Past-Pres. (4)—Anton Frederickson, 1st Vice-Pres. (5)—Helen Rotthaus, Secy.-Treas. (6)—John Rauscher, President. (7)—I. F. Brown, Director. (8)—R. M. Cushing, Director. (9)—A. W. Miller, Nat'l A.W.W.A. Director. (10)—John Hoover, Director.

ARIZONIANS MEET IN GLOBE

ONE hundred and fifteen members and guests assembled in Globe, Ariz., April 2-4, 1948, for the Spring Conference of the Arizona Sewage & Water Works Association.

The opening session included papers on "Cathodic Protection" by Frank MacDonald, Electro Rust-Proofing Corp., and "History, Development and Manufacture of Welded Steel Pipe" by Vic H. Householder, Armco Drainage & Metal Products, Inc. Miles A. Lamb, formerly a small plant operator and now Manager of the Sewage Equipment Engineering Dept. of Chicago Pump Co., presented a highly interesting and educational discussion on "Small Activated Sewage Treatment Plants," slanted to plant superintendents and operators.

During the second session, Mr. John Girand, Johannessen & Girand, Consulting Engrs. of Phoenix, presented a paper with the intriguing title of "An Assumption Times an Assumption Divided by an Assumption Equals a Positive Fact."

Operators' "Roundup" a Feature

The "Operators' Roundup," presided over by Reamy C. Fitch, Sr. San. Engr., Arizona State Dept. of Health, was inaugurated at the 1947 Fall Conference to answer questions and problems of operators. Proving to be such a popular addition to the program it was enlarged at this meeting to an hour's discussion in each of the afternoon sessions. Both technical sessions were closed by a general discussion of papers presented during the day. John A. Carollo of Headman, Ferguson & Carollo (Phoenix), served as moderator.

Delegates and their ladies attended a dinner Friday evening at the Cobre Valle Country Club at which Dr. Robert Nugent, Vice-President of the Univ. of Arizona, was the featured speaker. Musical entertainment was provided at the piano by John L. Mapes, Sparling Meter Co., Los Angeles.

Saturday's technical program, presided over by President Yost, was opened with a description of the "Buckeye Sewerage System". R. M. Cushing, of Headman, Ferguson & Carollo, Engrs. Following this, John Hoover, Utilities Supt. of the City of Mesa, described the "Mesa Water System" and its operation.

The interest and concern of the Association in regard to Arizona's groundwater resources and the use of Colorado River water was evidenced by the interest aroused by three papers presented. "Arizona's Groundwater Resources" by Sam F. Turner of the U. S. Geological Survey, Tucson, was followed by a colorful illustrated review of the Arizona-California controversy over the Colorado River problem. This paper, titled "Muddy Water—and, How It Got That Way," was presented by Milton G. Sanders, Vice-President of the Central Arizona Light & Power Co. R. Gail Baker, City Engineer of Phoenix, and Chief Engr. for the Arizona Interstate Streams Comm., followed Mr. Sanders with a discussion of the engineering aspects involved in harnessing the Colorado River for water and power.

The ladies present at the meeting were guests of the Association at the Saturday luncheon. Honored guest and speaker was N. T. Veatch, President of the parent Association. Another special guest at the luncheon was C. G. Gillespie, retired California State Sanitary Engineer, who acted as the official representative of the Federation of Sewage Works Associations.

Officers Elected

The following officers were chosen for the year ensuing—John Rauscher, President; A. Anton Frederickson, 1st Vice-Pres.; Geo. W. Marx, 2nd Vice-Pres.; Mrs. Helen Rotthaus, Sec'y-Treas.; Directors—A. W. Miller, I. F. Brown, W. Brinkerhoff, John Hoover, Harold W. Yost, R. M. Cushing.

During the closing session a quarter hour radio broadcast, outlining the history, purposes and accomplishments of the Arizona Sewage & Water Works Association, was made. Participating in the program were President Yost, Vice-Pres. Rauscher, A.W.W.A. President Veatch, and charter members Dario Travaini of Phoenix and A. L. Frick of Los Angeles. In addition to the local broadcast the program was wire-recorded for release from KTAR in Phoenix as part of the regular statewide broadcast — "Arizona Highlights."

At the afternoon business session the Awards Committee announced the selection of Alden W. Miller to receive the George W. Fuller Memorial Award of A.W.W.A. "in recognition of distinguished service and constructive leadership in the Arizona Section." The Committee also selected George W. Marx to receive the Kenneth Allen Award of the Sewage Works Federation in recognition of "outstanding leadership in administration and membership activity" in the Arizona Sewage & Water Works Association."

The closing technical session was presided over by Richard Bennett, Engineer, City of Phoenix, and the newly-elected president, John Rauscher, Engineer, Tucson Water Dept. Clark Webb, Dist. Mgr., Pacific States Cast Iron Pipe Co., Los Angeles, recommended "Double Mains" as most economical in paved or unpaved streets. Mr. Webb's paper later received a special award for excellence. "Harnessing Liquids" presented simple hydraulics in the form of a color film issued by Shell Oil Co. The popular "Operators' Roundup" and general discussion completed the day's session. It was announced that the 1948 Fall Conference would be held October 15-17 in Phoenix—hotel to be selected.

A dinner-dance at the Cobre Valle Country Club closed the day's affairs.

An inspection tour of the Inspiration Consolidated Copper Co. properties on Sunday morning closed the Conference.

(Photo by Paramount of Globe, Ariz.)

WHITE WATER TREATMENT AND RECOVERY*

Part I—Chemical Treatment and Clarification

by
WILLEM RUDOLFS AND EARL J. AXE
Chief and Research Associate
RUTGERS UNIVERSITY, NEW BRUNSWICK, N. J.

FOR reasons of mill economy, for conservation of resources and the alleviation of stream pollution, increasing attention is being given to the recovery of fiber and reclamation of water for reuse in the mills and its eventual discharge into receiving waters. Clarification of the socalled "white water" reduces pollution, aids in recovery of fiber, and may also make the water more suitable for reuse. The purpose of this paper is to present experimental data obtained in an effort to evaluate some physical and chemical methods of white water treatment. For the evaluation, two sets of data were used, those obtained by the treatment devices present in the mills, and those obtained experimentally in the laboratory.

Wastes Used

Samples of white waters produced in unit processes together with influents and effluents from recovery equipment in the mills, as well as total mill effluents, were collected from a number of mills for classification and experimentation.

The amounts of suspended and oxygen-demanding materials served as a basis for classification as follows:

Classification of Waste	Suspended Solids ppm.	BOD ppm.
Strong	400 and over	400 and over
Medium	200-400	150-300
Weak	100-200	100-150

Since samples from individual mills fluctuate in relation to suspended solids and BOD, some shifting of mills from one classification to another would occur.

Clarification by Settling

Some studies of the settling characteristics of the suspended material were made with existing mill equipment. The detention periods, rates of flow, and capacities were estimated, or obtained from data supplied by informed mill personnel. Typical average results obtained from newsprint and chipboard mills concerning the removals of turbidity and BOD with equipment of varying design are shown in Table I. Obviously 0.5 hour settling was insufficient, whereas more than 2 hours' settling did not materially improve the suspended solids removals. The 2 hours' settling results were obtained with an effective settling tank, of conventional design.

Laboratory experiments to determine the turbidity and BOD removals by quiescent settling for 30 min. with a number of samples from the same mills produced average results, as shown in Table 2. The degree of recirculation and the high temperature (100-140° F.) of the waste tend to increase the concentrations of materials producing turbidity and BOD, and affect the degree of removal obtained by plain settling.

Table I

REMOVAL OF TURBIDITY AND B.O.D. BY PLAIN SETTLING IN MILL EQUIPMENT

Settling Time Hrs.	Turbidity Infl. ppm.	Turbidity Effl. ppm.	Turbidity Removal %	5-Day B.O.D. Infl. ppm.	5-Day B.O.D. Effl. ppm.	5-Day B.O.D. Removal %
0.5	495	395	19.5	215	172	20.0
2.0	410	164	60.0	279	183	34.4
4.0	700	272	66.7	196	159	19.0

Table II

REMOVAL OF TURBIDITY AND B.O.D. BY QUIESCENT SETTLING FOR 30 MINUTES

Mill No.	Suspended Solids ppm.	Turbidity Initial ppm.	Turbidity Time ppm.	Turbidity Rem. %	B.O.D. Initial ppm.	B.O.D. Time ppm.	B.O.D. Rem. %	Sludge Value %
4a	205	510	240	53.0	214	143	33.1	7.5
8	844	890	400	55.0	260	182	30.0	9.7
4	668	1447	950	35.2	784	715	9.0	9.0

Plain settling of separate wastes from specialty mills accomplished removals of about 70 to 75% of the suspended materials. The maximum removals were obtained in the cooking liquors at pH 11.0 to 11.5 and the least in the neutral bleach liquors.

Plain settling of the combined wastes for 30 min. in the ratio of their production in the mill was about 50% less effective for the removal of suspended material than was obtained by settling them separately. The production ratio of these wastes is about four of the cook wash to one of the bleach wash. When the two wastes were mixed in the proportion of two parts cook wash to three parts bleach wash, the removal of suspended material amounted to about 10% more than was obtained by separate settling for one hour, and about 50% more than by settling in the production ratio. Similar results were obtained by settling a mixture in the proportion of one part cook to four parts bleach.

Clarification by Mechanical Flocculation

Slow stirring of some boardmill wastes generally effects a certain amount of coalescence, and the percentage of removal of turbidity obtained varies with the mill and in the same mill, depending upon the operation. In other mill wastes, particularly those produced at higher than normal temperatures, the higher temperatures appear to cause dispersing of the particles, forming a protective film which serves to envelop the particles with a stabilizing material, or the presence of some unprecipitated alum may serve to peptize. As a result, stirring induces an excess of particles with similar charges, causing an increase in turbidity and B.O.D. The turbidity removals obtained by flocculation varied from 30 to 60%, and B.O.D. reduction from 13 to 37%, or the same as those obtained by plain settling.

The effect of flocculation and settling of whole and mixed cooking and bleach liquors at pH values of 3.2, 5.0, 7.0, and 9.0, was studied by flocculation and settling for 30 min. The results show that the removal of both suspended materials and B.O.D. in nearly all cases increased 5 to 15% as

*Paper of the Journal Series, New Jersey Agricultural Experiment Station, Department of Sanitation, Rutgers University.

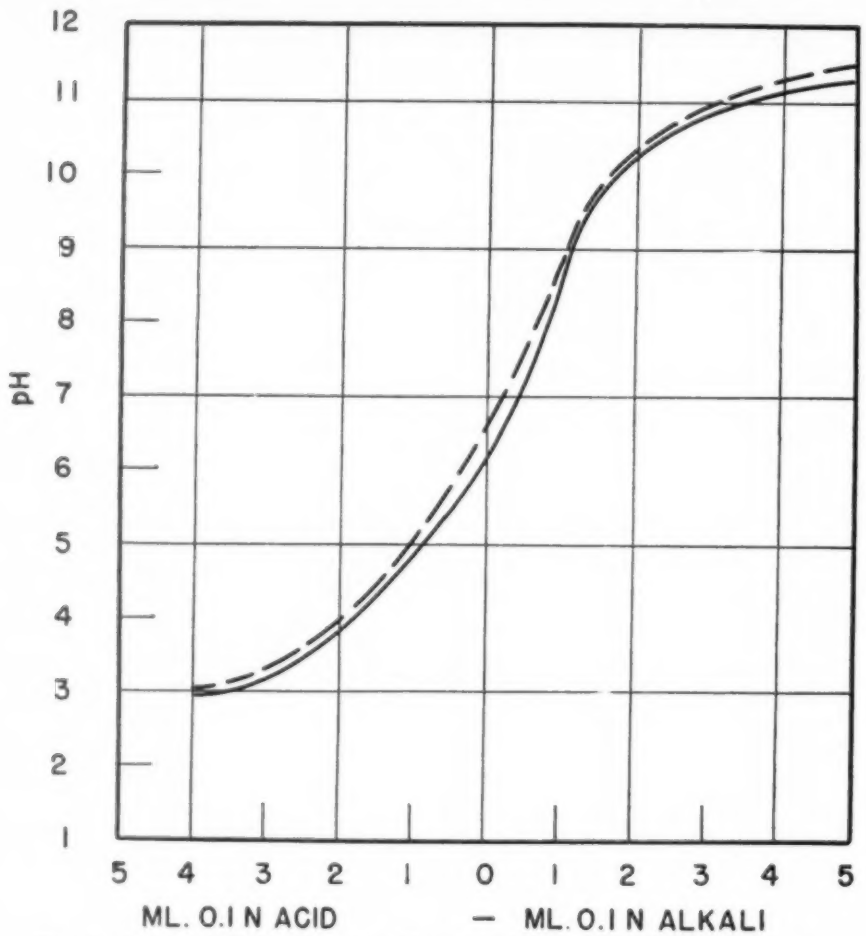


Fig. 1. Typical Neutralization Curves of Boardmill White Waters.

the pH value diverged from neutrality. The removals were generally higher in the mixed wastes than in the whole wastes. The removal of B.O.D. from the whole wastes followed the pattern of removal of suspended solids. The overall removals of suspended material varied from 75 to 95%, averaging 87%, with accompanying reductions in B.O.D., averaging about 30%, irrespective of the ratio of the mixtures or the pH adjustment. Color was also reduced by flocculation in both the separate and mixed wastes from about 550 ppm. to an average of 290 ppm., or about 50% irrespective of pH value.

Clarification by Coagulation

Experiments were made to determine the removals of suspended materials by coagulating with the more commonly used chemicals. Alum is the papermakers' coagulant and the quantities used in the beaters in paperboard manufacture vary from 10 to 30 pounds per 1000 lbs. of stock.

1. Removal of Turbidity with pH Adjustment

An attempt was made to produce suitable conditions for precipitation of alum in solution in the wastes by making additions of alkali or acid to cover a range of pH values for determining the removal of turbidity by pH adjustment. Typical neutralization curves of boardmill white water are shown in Fig. 1. The removal of turbidity at pH values 4.0 to 10.0 varies somewhat for the wastes from the individual mills. The average removals of turbidity effected at these pH values show in general that the addition of acid effects only a relatively small removal of turbidity. The maximum removal is obtained on the alkaline side. The optimum pH for the maximum removal varies with the wastes. The trend of removals of turbidity effected by pH adjustment was about 50% at pH 4 and gradually increasing to 88% at pH 10.

2. Clarification with Alum

Wastes used for coagulation studies were first passed through 100-mesh screens to remove settleable particles or those retained by effective recovery equipment in the mills.

The dosage generally required to produce a floc of clarifying character varied between 2 and 10 lbs./1000 gals. The average alum dose of 2.7 lbs./1000 gals. produced removals of about 91% of the turbidity and about 30% of the B.O.D.

3. Clarification with Alum and Lime

Coagulation of white water with alum may result in incomplete clarification with increasing doses of alum because the natural alkalinity for the reaction is exhausted and the pH reduced below the optimum by the quantities of coagulant required for the clarification desired. The optimum pH values for clarification of most samples ranged from 5.0 to 6.0. An average alum dose of 3.8 pounds supplemented with about 1 lb. of lime per 1000 gals. effected average removals of 95% of the turbidity and 25% of the B.O.D. But certain wastes treated with 1.0 lb. of alum per 1000 gals. and 0.5 lbs. of lime, produced 92% clarification and removed about 40% of the B.O.D.

4. Clarification with Alum and Activated Silica

Experiments using activated silica were made to determine the applicability of the treatment to boardmill wastes for possible economy of chemicals and settling tank capacity.

The removals of turbidity obtained indicate possible savings in both the amount of coagulant required and in settling tank capacities for the clarification of these wastes.

In average wastes which had required 2 lbs. of alum per 1000 gals. to effect a removal of 96% of turbidity, nearly equal clarification (92% removal) was obtained with less than 0.1 lb. per 1000 gal. and 0.03 lb. of silica. Strong waste which required 9 lbs. of alum to produce 80% clarification, required 3 lbs. of alum with 1.2 lbs. of silica per 1000 gals. to effect 97% clarification. The removal of B.O.D. was greater with alum and silica than with alum alone from average wastes. Removal of B.O.D. from the stronger wastes was 35 to 50% less with alum and silica than with alum only. Effective clarifying flocs produced by alum and activated silica are large and settle quiescently about one-third to one-half faster than those produced by alum alone.

The comparative costs of treatment are interesting, particularly for mills discharging volumes of wastes of 0.3 to 3.5 mgd.

Comparative costs of treatment per million gals. strong waste alum = $180.00; alum plus silica = $152.50; for average waste alum $40.00, alum plus silica = $4.15.

The saving in cost of chemicals resulting from the alum-activated silica treatment of boardmill wastes may range from $8.00 to $125.00 a day for the volumes produced.

5. Clarification with Lime

The clarification of paperboard mill wastes with lime in economical doses was investigated for comparison with other coagulants. The removals of turbidity and B.O.D. in four boardmill wastes are given in Table III.

Table III

CLARIFICATION OF WHITE WATER WITH LIME IN OPTIMUM DOSES

Mill No.	Dose per 1000 gals.	pH		Turbidity		B.O.D.	
		Before	After	Initial ppm.	Rem. %	Initial ppm.	Rem. %
7	0.2	7.0	7.3	525	98	200	43
8	0.4	7.0	7.7	1240	95	330	51
4a	0.3	6.6	10.0	750	96	170	23
4	2.0	6.6	10.4	1460	90	700	14
Ave.	0.73				95		33

Coagulation of average and strong boardmill wastes is also produced with additions of $Ca(OH)_2$. Additions of economical doses of 0.2 to 0.4 lbs. of lime to average mill waters effected about 95% clarification, and removals of B.O.D. from about 23 to 50%. In the stronger waste waters 2 lbs. of lime per 1000 gals. produced 90% clarification and a removal of 14% of the B.O.D. at a pH of 10.0.

The color of the wastes changed at about pH 9.0 and the supernatants appeared yellow. The yellow color was intensified with increasing pH values.

6. Clarification with Ferric Chloride

The clarification obtained with ferric chloride shows about 90 to 95% removal of weak to average boardmill white waters in doses of 0.2 to 1.0 lb. per 1000 gals. with removals of B.O.D. of 25 to 50%. In strong white waters 5.0 lbs. per 1000 gals. achieved about 82% clarification and 13% removal of B.O.D.

7. Clarification with Ferric Sulphate

The removals of turbidity in these waters averaged about 93%, with corresponding removals of B.O.D. of 22 to 44%, or about the same as those obtained with similar doses of the other coagulants. The remaining turbidities and B.O.D. in the supernatants were also similar.

Comparison of Removal of Turbidity and B.O.D. by Chemical Coagulation

The variations in both chemical demand and degree of clarification effected by the chemical treatment of boardmill white waters make difficult a formulation for the effective dosage of any one coagulant, the coagulant demand of a particular waste white water, or the relation between the removal of turbidity and the removal of B.O.D. Figure 2 shows the trends of removals of turbidity and B.O.D. in strong and average boardmill wastes by chemical coagulation irrespective of chemicals.

Sludges Obtained by Clarification

The volumes of sludges obtained by settling varied from 6.2 to 9%, averaging 7.7%. Flocculation increased the volume of sludge; however, in several mills the average volumes of sludges were decreased by flocculation. Variations from 6.8 to 8.7%, averaging 7.8% sludge volumes, were obtained.

The volumes of sludges from alum-treated waters varied from 7.5 to nearly 10%, averaging about 8.7%. The average alum sludge volume was about 17% less than the average alum-and-lime-produced sludges, and from 6 to 15% less than sludges produced by other coagulants.

Alum- and lime-treated waters produced sludges in volumes varying from 7.0 to 14%, averaging about 10%. Lime-treated waters produced sludges varying from 7.6 to 10.5%, averaging 9.3%. The volumes of sludges from waters treated with ferric chlorides varied only from 10 to 10.1%, whereas waters treated with ferric sulphate produced sludge volumes varying from 8.3 to 12% and averaging about 10.3%.

The mills producing the weaker wastes generally produced the least sludges, regardless of clarification treatment.

Discussion

The effectiveness of plain settling for the removal of turbidity and B.O.D. varies widely. The materials producing most of the turbidity and B.O.D. are in a finely divided state, or are in solution and do not settle readily; hence, this treatment is generally relatively ineffective for clarification of these wastes.

Clarification by mechanical stirring or flocculation is extremely variable. Stirring may be beneficial or detrimental, depending upon the nature of the materials in suspension.

The chemical coagulants studied in connection with clarification of white waters were found to be about equally effective for removal of turbidity when adequate quantities were added with proper pH adjustment. In average wastes relatively small quantities

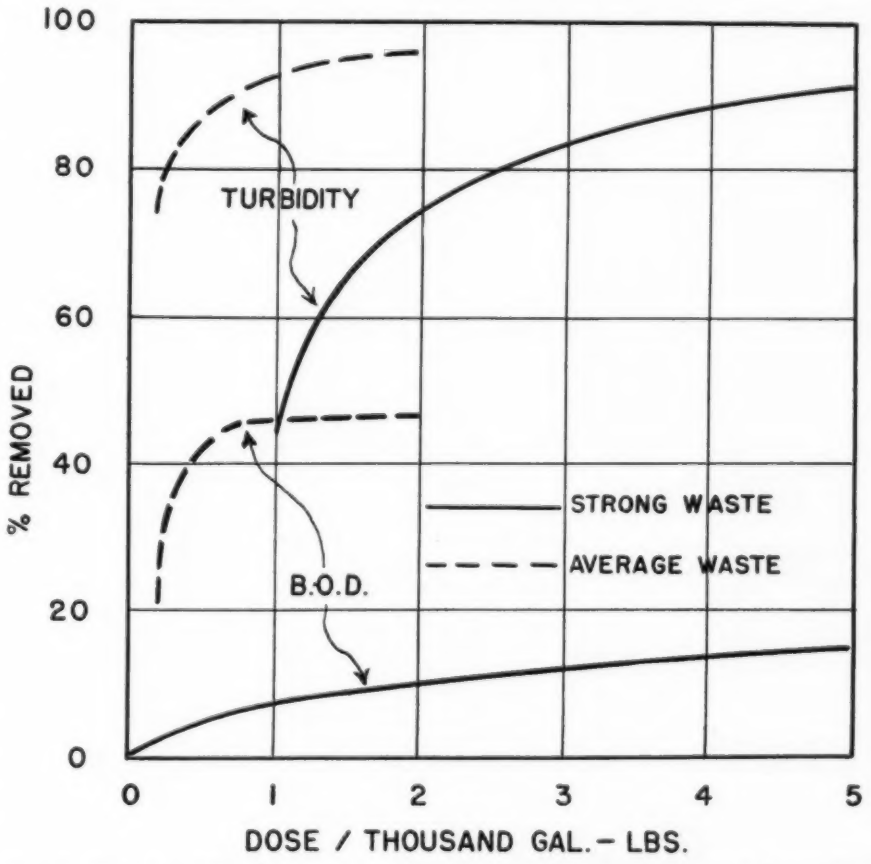


Fig. 2. Trends of Removal of Turbidity and B.O.D. by Chemical Coagulation, Irrespective of Type of Chemical Employed.

of any of the coagulants were required whereas for the stronger wastes the quantities may approach economically prohibitive doses.

Alum supplemented with activated silica appears to offer some considerable reductions in chemical dosage required and overall cost for the treatment of white water. The estimated saving in cost of chemicals may be sufficiently attractive to warrant either pilot-plant study or full-scale installations where adequate control of the treatment process may be coordinated with the mill processes under circumstances which permit the correlation of the results to the variations in flow and the character of the waters.

Chemical treatment with settling for 30 min. is generally effective for the removal of 90 to 95% of the turbidity in these wastes. Because most of the B.O.D. is exerted by the material in solution, this treatment is effective in removing an average of only about 25% of the B.O.D. Complete clarification removes about 15% more, and, therefore, does not solve the pollution problem for the final disposal of the average or stronger wastes.

Sludges produced by settling, flocculation, and chemical treatment vary from 8,000 to 20,000 cu.ft. for settled and flocculated sludge, and average about 13,000 cu. ft. per million gallons for chemically treated sludges. The volume of sludge from one million gallons of average waste per day accumulates at the rate of about 12 cu.ft. per minute, and unless returned continuously to the mill system requires considerable storage capacity. Furthermore, stored sludge tends to deteriorate rapidly, thus increasing the possibility of machine difficulties when returned to the system.

SUMMARY

Methods of clarification existing in paperboard mills were studied and laboratory experiments made to determine the effectiveness of procedures. It was found that mill recovery equipment of the vacuum filter type, as well as conventional settling tanks, is, on the average, about 50% effective for the removal of suspended materials. The reduction of B.O.D. averages less than 25% in mill recovery equipment or in the laboratory. Plain settling of the wastes, either in the mill or in the laboratory, effects reductions of about half of the turbidity. Two hour settling time in effective tanks produces as good results as four hour settling time in conventional types of tanks.

It is extremely doubtful that mechanical flocculation is of value for the clarification of these wastes.

In practice and experimentally, about 90% of the suspended material and turbidity is removed by chemical coagulation and settling, regardless of the coagulant employed. Removal of B.O.D. by chemical coagulation and settling is little more effective than plain settling.

Chemical doses required for coagulation vary with the wastes and the nature of the soluble and semi-soluble constituents, and with the coagulant employed.

Alum supplemented with activated silica was found to be from 3 to 20 times more effective than alum alone, for similar removals of turbidity. When used in similar doses, alum, ferric chloride, ferric sulphate, and alum supplemented with lime effect about the same degree of removal of turbidity.

Volumes of sludges produced by plain settling and by mechanical flocculation and settling, are generally from 1 to 2 per cent less than those obtained by chemical coagulation and vary somewhat with the waste. The volume of sludge produced by clarifying one million gallons of average boardmill waste amounts to about 13,000 cu.ft. after a 30 minute settling.

Separate treatment by settling of cooking and bleach liquors produced better results than settling of combined wastes in various proportions. Flocculation and settling of cooking and bleach liquors showed that removal of suspended matter and B.O.D. increased as the pH value diverged from neutrality.

(The second installment of this article deals with "Filtration and Filter Aids." It will appear in an early issue.—Ed.)

Hummelstown, Pa. Has Diesel Standby

The Hummelstown Water Supply Co., a subsidiary of the Harrisburg Suburban Water Co. of Harrisburg,

Pa., supplies the city with 720,000 gallons of water daily. The supply is drawn from a creek which also supplies a source of power for a water turbine when sufficient creek water is available. As a standby source of power when the water in the stream recedes to a point where it cannot operate the water wheel which powers the pump, a diesel electric set was installed.

The diesel is a Caterpillar D8800 and the pump is a Worthington pump.

Louisiana Short Course in July

The Annual Short Course for personnel employed in water and sewerage departments in the State of Louisiana will be held at Louisiana State University on July 14, 15, and 16. This is the eleventh successive year in which a short school has been available.

The Short Course is sponsored by the General Extension Division and College of Engineering of Louisiana State University in cooperation with the Louisiana State Dept. of Health and the Louisiana Conference on Water Supply & Sewerage.

Among the highlights of the program scheduled are discussions of water-borne diseases, back siphonage hazards, uniform plumbing code, emergency chlorination of wells and reservoirs, sewerage maintenance, drinking water standards, cathodic protection for elevated tanks, taste and odor control, maintenance of motors and pumps, measurement of sewage flow, and a dozen or more other items.

Washington Suburban Water Reservoir

The accompanying photograph shows the new 10,000,000-gallon welded steel reservoir constructed for the Washington Suburban Sani-

tary Commission at Carmody Hills, Maryland. Constructed by the Chicago Bridge and Iron Co. the reservoir is 292 ft. in diameter and 21 ft. high. The Washington Suburban Sanitary Commission supplies water to the area surrounding Washington, D.C.

OPERATION OF MONOHEARTH GARBAGE AND REFUSE INCINERATOR

Experiences of the Town of Tonawanda, N. Y.

by

NEWELL L. NUSSBAUMER
Consulting Engineer
BUFFALO, N.Y.

and

ALEXANDER G. MARTIN*
Member Town Board
KENMORE, N.Y.

PRIOR to 1946, the town of Tonawanda had in operation two 40 ton mutual assistance type furnaces, housed in a three level building with a tipping, charging, and stoking floor. The first unit and building was built in 1927 and the second unit was added in 1928. After 17-18 years of service the Town Board let a contract for the construction of a 100 ton Monohearth Incinerator to be housed in a three level building with charging, stoking, and ash removal floors. This addition was placed in operation in December 1945 and operation of the old plant discontinued except for peak deliveries. The installation was described in the September 1945 issue of *Water Works & Sewerage*, (now *Water & Sewage Works*). After two years of operation reliable data on the plant operation from fairly accurate records is of interest.

The Town of Tonawanda burns refuse and garbage from the Village of Kenmore on a contract basis, and also collects and burns garbage and rubbish from five special garbage collection districts, and a Federal Housing Project in the Town. There is a separate ash collection which is taken directly to the Town dump. Because of this assessment arrangement, careful and accurate weights of all loads are kept daily.

The staff at the incinerator prior to 1946 included one Superintendent and three Operators, with a fourth being added during peak months, usually August and September, and at other times during wet weather or heavy snow. When the new furnace was placed in operation the four regular men were retained on the pay roll with somewhat different duties assigned.

Present Staff

Now the Superintendent runs the plant as before and at times of heavy deliveries helps with charging. One of the operators operates a bulldozer for charging on the charging floor. The second operator assists in charging and at other times does such stoking as may be necessary. The third operator works one of the old furnaces when required, and at other times removes ashes, and operates a bulldozer on the dumps. The salary of these four men is charged against the Incinerator Account.

*In charge of Municipal Improvements, Town of Tonawanda.

The Authors
N. L. Nussbaumer **A. G. Martin**

The collection systems for both the Village of Kenmore and the Town of Tonawanda are on an eight hour basis. The collection forces begin work so that the first deliveries to the incinerator will be about 9:15 a.m. The schedule at the incinerator is as follows:

8:00 a. m.—Men report, clean ash hopper, charge any material left from night before and do miscellaneous work.

9:15 a. m.—First load of garbage and rubbish arrives.

12:00-12:30—Lunch Period.

3:30 p.m.—Approximately the time for last delivery.

4:30 p.m.—Charging finished and furnace checked.

The men are paid for nine hours of work on week days and eight hours on Saturdays. The average hours of work throughout the year balance out approximately to this figure.

The collection equipment includes the following:

Village of Kenmore

2—Mack Trucks with 17 cu. yd. bodies equipped with sideboards.

1—Mack Truck with 8 cu. yd. body for store collections.

Town of Tonawanda

2—Gar Wood Packer enclosed Trucks—13 cu. yd.

1—Open Truck with 4 cu. yd. body.

Collections are made once per week to residences by both municipalities; Village stores are collected once per day; and the restaurant collections are always on Wednesdays.

On the average, 15 loads are delivered to the incinerator on week days, as follows:

6 Trips by 17 cu. yd. Trucks
2 Trips by 8 cu. yd. Trucks
6 Trips by Gar Wood Packers
1 Trip by 4 cu. yd. Truck

15 Trips—Total

The deliveries in pounds and tons to the incinerator per day and week of average conditions for the year 1947 are given in Table I.

Table I

TABULATION OF DELIVERIES TO TOWN OF TONAWANDA INCINERATOR FOR TYPICAL WEEKS IN EACH QUARTER OF YEAR

Deliveries Are in Pounds Per Day

Day of Week	January	April	July	November
Mon.	104,100	89,900	85,500	108,800
Tues.	73,000	75,000	75,700	89,400
Wed.	74,900	83,100	82,000	103,500
Thur.	78,700	76,700	79,300	99,800
Fri.	74,300	74,300	68,100	84,600
Sat.	59,200	56,300	59,400	70,800
Sun.	.....	.....	.....	.....
Week Total (lb.)	464,200	455,300	450,000	556,900
Week Total (Tons)	232.1	227.6	225.0	278.4
Average Ton: per Day	38.7	37.9	37.5	46.4

In some communities there is a greater variation in the volume of collections between Spring and Fall. Collections in the Town of Tonawanda, including Kenmore, are at a minimum in February and a maximum in September, the latter being about 50 per

cent more than the minimum. These monthly variations for the years 1946 and 1947 are shown on Chart A.

Annual collection figures are available for the last ten years. The amounts in tons are shown on Chart B. It will be noted that the curve of increase is fairly uniform, and that the total in 1947 was double that in 1938.

The population statistics for the Town since 1905 when the City of Tonawanda separated from it, are as follows:

Date	Population	Garbage and Refuse Yearly Tons Per 1,000 Population
1905	1,511	
1910	2,175	
1915	3,062	
1920	5,505	
1925	10,539	
1930	25,006	
1940	32,155	234
1947 (Est.)	43,000	292

During the period from 1940 to 1947 the population increased 50 per cent and the volume of collections about 60 per cent. Collections of 292 tons per year per 1,000 population is more nearly normal than the lower figure in 1940.

Of this annual total burned since the new 100 ton unit has been placed in operation, about 575 tons or 4.6 per cent was burned in the old furnaces which were operated at peak collection periods only, to permit the operators to finish in a shorter day.

Before and After Comparisons

The only records available for comparison as to the number of man hours required to operate the original furnaces and the present furnaces, are those in 1942 and 1943 when a record was obtained of the peak load for each month given in Table II.

In 1947 during parts of the months of July and August all deliveries to the incinerator were burned in the Monohearth Unit. At this time only three men were working the plant, the Superintendent and two Operators, with the exception of Mondays when the weekend cleaning is performed and the third operator was on hand.

The third operator was sick part of the time and assigned to other duties the balance of the time. Table III gives data similar to the above for the operation of the Monohearth Unit:

Table III

RECORD OF GARBAGE OPERATIONS IN 1947

Year	Month	Tons Mat. Burned	Hours of Work	No. of Men	No. of Man Hrs.	Man Hours Per Ton
1947	July 21 M.	43.45	9.5	4	38	0.87
	22 T.	38.55	8.5	3	25.5	0.66
	23 W.	37.2	8.5	3	25.5	0.69
	24 T.	36.5	8	3	24	0.66
	25 F.	34.8	8	3	24	0.71
	26 S.	28.1	6	3	18	0.64
	28 M.	43.5	8	4	32	0.72
	29 T.	46.9	10	3	30	0.64
	30 W.	45.6	9	3	27	0.59
	31 T.	38.6	8	3	24	0.62
	Aug. 1 F.	33.35	8	3	24	0.72
	2 S.	27.35	6	3	18	0.66
	Average	37.8				0.68

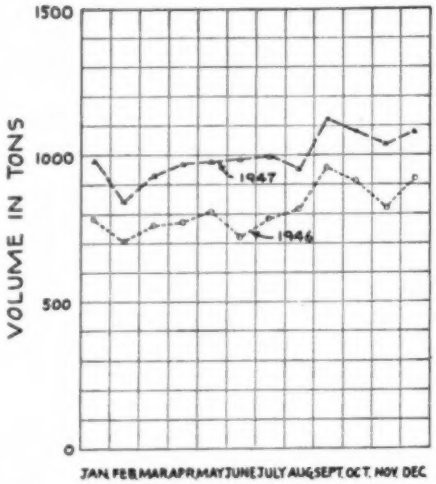


Chart A—Tons of Garbage and Rubbish

Incinerated Monthly in the Town of Tonawanda.

There are two factors which make direct comparisons unfair, or some adjustment necessary, here described:

(a) A bulldozer was used to assist in charging the Monohearth. No bulldozer was on hand in 1942-43 for use with the original furnaces. However, the design of the Incinerator Building was such that a bulldozer could not have been used anyway. The building was designed with a tipping floor from which material dumped from trucks was guided to the charging holes of the furnaces on the floor below. The investment in this extra floor far exceeded the cost of a bulldozer. Whether the cost was justified is another matter.

(b) The Monohearth is equipped with an ash hopper fitted with quenchers under which a truck can pass. The expense of dumping ashes is negligible.

The original furnaces did not have ash hoppers. Ashes were withdrawn either from ash doors or the burning grates all at the stoking floor level, into specially designed ash carts holding about one-half cubic yard each. These latter were lifted by a hoist, and dumped into a truck.

The length of haul was the same in each case, but the volume of ashes was greater in the first case than later with the Monohearth, as will be indicated.

The same ash truck was in use for both installations up until the middle of last year at which time a new one was bought. From four to eight trips to the dumps were made with ashes from the original furnaces, depending upon the amount of material burned. Now with the Monohearth there are usually not over two loads of ashes, with a maximum of three loads during peak periods. During some tests on burning rates which were made with the Monohearth, the ashes were weighed wet as they came from the ash hopper. The results are shown, as follows:

Pounds Material Burned	Pounds of Ashes	Per Cent Ashes
39,000	4,000	10.2
20,900	2,000	9.6
22,000	2,400	10.9

A number of tests have been made of the moisture content of the com-

Table II

RECORD OF GARBAGE OPERATIONS IN 1942-43

Year	Month	Tons Mat. Burned	Hours of Work	No. of Men	No. of Man Hrs.	Man Hours Per Ton
1942	Mar.	32.2	11.5	4	46	1.43
	Apr.	32.4	10	4	40	1.24
	May	30.65	10.5	4	42	1.37
	June	40.2	11.5	5	57.5	1.43
	July	35.4	10	5	50	1.41
	Aug.	32.9	10.5	5	52.5	1.59
	Sept.	51.95	14	5	70	1.35
	Oct.	35.55	11	5	55	1.55
	Nov.	40.65	9.5	5	47.5	1.17
	Dec.	46.6	12.5	4	50	1.07
	Avg.	37.85				1.36
1943	Jan.	46.55	12	4	48	1.03
	Feb.	35	12.5	4	50	1.43
	Mar.	34.2	9	4	36	1.05
	Apr.	31.15	9	4	36	1.16
	May	34.3	10	4	40	1.16
	June	42.1	10.5	4	42	1.00
	July	37.6	10	4	40	1.06
	Aug.	33.9	10	4	40	1.18
	Sept.	42.95	12.5	5	62.5	1.46
	Oct.	39.95	12	5	60	1.50
	Avg.	37.77				1.20

bination of refuse and garbage delivered to the incinerator. The following points have been noticed:

(a) During dry periods in the Summer, the moisture content would generally be below 50 per cent.

(b) During wet periods in the Summer, the moisture content would vary from 60 to 70 per cent moisture.

(c) During cold dry periods in the Winter, there would be the least moisture content in the material, some tests being below 40 per cent.

(d) During periods of heavy snowfall with possibly a thaw and then a freeze to form ice, the greatest percentage of moisture occurs. At such times it has been necessary to burn some auxiliary fuel. None has been used at other times.

The record of auxiliary fuel used is shown in Table IV.

Present Costs

In order to arrive at present costs of garbage incineration operations the data in Tables V and VI were prepared.

The schedule of operating and maintenance costs taken from the Town records for the year 1947 is shown in Table V.

The labor charges are on a quarterly basis. The base rate is $1.09 per hour for the operators. The men have two weeks vacation, sick leave benefits, and seven holidays with pay. Capital improvements are also charged under maintenance. Such items are included as the new wall along the driveway and the purchase of a new Ash Truck. We have computed a total sum which we believe should be asssessed against the operation of the Monohearth Unit, omitting the charges to the original furnaces, and all capital improvements. We have computed the operating cost per ton, by dividing this figure by the number of tons of material incinerated in the Monohearth, deducting the tonnage burned in the original furnaces. These data are shown in Table VI.

Table VI

SCHEDULE OF ADJUSTED OPERATING CHARGES

Item	Total All Furnaces	Deducted For 2 - 40 Ton Units	Capital Improvements	Balance For Monohearth
Labor	$12,896.72	(A) $1,246.00		$11,650.72
Power	401.12			401.12
Water	71.10			71.10
Gas	142.15			142.15
Telephone	111.20			111.20
Misc.	1,088.65	(B) 306.58		
		(C) 63.92		718.15
Maint.	4,810.12		(D) 986.00	57.35
			(D) 1,351.00	
			(E) 1,670.00	
			(F) 735.77	
Totals	$19,521.06	$1,616.50	$4,742.77	$13,151.79

A—The one man—six months.
B—Coal.
C—One-third of $191.76—which is repairs and tires to old Ash Truck.
D—Repairs to old furnaces.
E—New Ash Truck.
F—Wall construction.

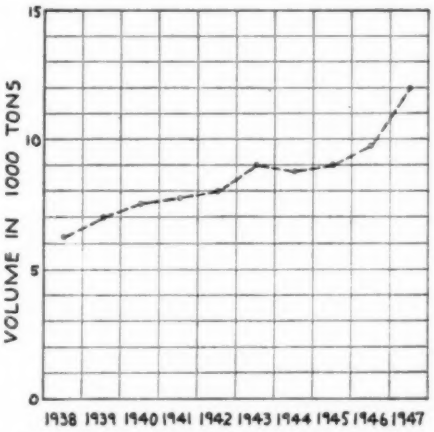


Chart B—Tons of Garbage and Rubbish

Incinerated Annually in the Town of Tonawanda.

The total tons collected and burned in the incinerators in 1947 was as follows:

Burned in all furnaces	11,967 tons
Burned in two—40 ton original furnaces	575
Balance burned in Monohearth	11,392 tons
Total cost of Monohearth operation 12 months	$13,151.79
Total number of tons incinerated	11,392
Cost per ton of incinerated material	$1.15

In the two years of operation, no major item of repairs to either the Monohearth incinerating equipment or the building in which it is housed have been required. From recent inspections the condition of the structures do not indicate that any will be required in the near future.

Some incinerator plants are built oversize to have surplus incinerating capacity, so that at peak periods of deliveries, there will be furnaces available to accept material received at the incinerator without storage or rehandling. Other public works departments pay more attention to scheduling collections delivered to the incinerator, so that they are spaced for even incinerator operation, and do not arrive in bunches, then causing either delays in unloading or rehandling of the materials. If one is to try to arrive at an over-all cost of incinera-

Table IV

RECORD OF AUXILIARY FUEL USED

Year	TONS COAL USED 2 - 40 Ton Furnaces	TONS COAL USED 100 Ton Monohearth	COST IN DOLLARS 2 - 40	COST IN DOLLARS Monohearth
1938	102.5		$ 705.53	
1939	77.5		534.75	
1940	104.25		719.33	
1941	90.		621.00	
1942	164.25		1,135.05	
1943	45.75		315.68	
1944	71.50		493.35	
1945	78.00		538.20	
1946	30.00	7.5	186.09	$51.75
1947	36.21	3.7	306.58	29.33

Table V

OPERATING COSTS IN DOLLARS

Month	Labor	Power	Water	Gas	Telephone	Misc.	Maintenance
Jan.		$ 40.80	$ 4.40	$ 25.33	$ 10.85	$ 70.07	$ 8.23
Feb.		42.87	3.20	22.53	11.90	(B) 90.14	(F) 986.00
Mar.	$ 3,194.67	48.98	7.20	19.87	10.00	30.72	.....
Apr.		43.65	3.00	13.85	8.75	39.68	.....
May		43.28	8.50	3.08	8.50	(C) 376.24	.....
June	3,228.03	31.11	7.20	2.90	9.00	16.98	(G) 1,351.79
July		42.87	7.00	4.06	9.50	28.85	(H) 428.30
Aug.		18.88	10.40	3.76	8.00	(D) 143.46	(I) 60.55
Sept.	2,960.29	15.75	8.20	3.76	9.30	(E) 141.68	(J) 1,793.46
Oct.		20.13	4.00	2.90	8.20	35.52	(K) 123.46
Nov.		17.80	4.00	15.11	8.45	80.31	58.33
Dec.	(A) 3,513.73	35.00	4.00	25.00	8.75	35.00	.....
Total	$12,896.72	$401.12	$71.10	$142.15	$111.20	$1,088.65	$4,810.12

A—Includes Sick Leave.
B—Includes repairs to Ash Truck—$62.91.
C—Includes tire for Ash Truck—$38.00; repairs to adding machine—$12.43; coal for Monohearth—$29.23; coal for two original furnaces—$306.58.
D—Includes one tire for Ash Truck and two for Bulldozer—$118.40.
E—Includes tires and repairs to Ash Truck—$52.85.
F—Repairs to old furnaces.
G—Repairs to old furnaces.
H & I—Construct new wall along driveway.
J—New Ash Truck cost $1,670.00 net with trade in; balance on wall construction.
K—Construct new wall along driveway.

tion, and use this in comparison with other municipalities, then the cost of the incinerator structure, furnaces, and other appurtenances should be considered, and any unusual provisions made in the collection department to relieve expense at the incinerator.

The Town of Tonawanda incinerator addition housing the 100 Ton Monohearth unit was bid in December, 1944, at a price of $105,000.00, and completed in December, 1945. Part of this money was used to extend the charging floor over the old tipping floor in the original building. Some of the original ramps were of use in the new construction. It is probable that an independent structure at that time for 100 ton capacity would have cost about $125,000.00. Based upon bids received during the summer of 1947 a similar plant in December, 1947, would cost about $190,000.00. To these figures must be added engineering, legal, administrative fees, and interest during construction averaging about 13 per cent, to secure a complete project cost. The common labor rate during construction was $1.05 per hour. The rate now is $1.25. On the basis of total project cost, the investment cost per ton would be as shown in the table below.

There is now more interest in municipal incineration than there has been in some years. Such interest seeks out information regarding construction and operating costs. These in the past have not been compared or coordinated on a uniform basis. It is hoped that additional information will be forthcoming from other communities where accurate records are kept in sufficient detail that it may be adjusted to standards which may be used for comparison, taking into account factors such as wage rates, plant size, facilities provided, and construction costs.

Date	Construction Cost	Eng., Legal, Int., etc.	Project Cost	Investment Cost per Ton
Dec. 1944	$125,000	$16,000	$141,000	$1,410.00
Dec. 1947	$190,000	$24,000	$214,000	$2,140.00

SEVENTEENTH ANNUAL ARKANSAS WATER & SEWAGE CONFERENCE*

A well worked out program, which was presented with practical demonstrations and illustrated with moving pictures, carefully prepared committee reports, and the enthusiastic promotion of district organizations for more frequent meetings were outstanding features in the Seventeenth Annual Arkansas Water and Sewage Conference. This meeting was held in Fayetteville in the Business Administration Building of the University of Arkansas. Voluntary Licensing Examinations were held before the Conference in the Engineering Building under F. L. McDonald.

The Conference began on Monday, April 12, under the direction of J. R. Pierce, Chairman, and adjourned before noon on Wednesday after voting unanimously to hold the 1949 meeting in Little Rock. The address of President Lewis Webster Jones of the University of Arkansas at the Conference Dinner told of recent progress within the state and varied plans for future development.

George H. West represented the Southwest Section of the American Water Works Association at the Conference and gave a helpful paper on Water Quality Production. Honorary Membership was conferred on Albert H. Ullrich, a charter member of the Conference.

Officers elected to serve for the ensuing year included the following:

Chairman
Solon Sanderson, Supt.
Marianna, Ark.

Vice Chairman
Fay Peer,
Van Buren, Ark.

Secretary
Harrison Hale, Prof. U. of A.
Fayetteville, Ark.

Program Committee Chairman
W. A. Mayhan,
Little Rock, Ark.

The following persons were elected to serve on the Executive Committee: W. R. Spencer, Fayetteville; Cecil Brown, Pine Bluff; Joe W. Cline, West Helena; L. J. Embree, Magnolia; M. E. Evans, Lonoke; P. E. Horton, Russellville; and Elmo A. Lambert, Clarendon.

*From notes by Harrison Hale, Secy., Arkansas Water & Sewage Conf.

17th Annual Ark. Water and Sewage Conf. University of Arkansas, April 12
(Retiring Chairman, J. R. Pierce, Pine Bluff, stands in first row, center)

SOME RIGHTS AND WRONGS OF CANNERY WASTE TREATMENT*

by

CHRISTIAN L. SIEBERT
Cons. Engineer
CAMP HILL, PENNA.

and

CLAIRE ALLISON
Hanover Canning Co.
HANOVER, PENNA.

MANY papers have been written on the treatment of cannery wastes and many different opinions are held in the canning industry concerning adequate and practical methods of treating such waste waters but the fact remains that few canneries can boast of waste treatment systems which are entirely acceptable to state agencies responsible for control of stream pollution.

It is true that some states have not yet invoked rigid standards applicable to the treatment of industrial waste waters, but Pennsylvania is aggressively attacking the problem of cleaning up its streams and most other states either have already adopted or are seriously considering laws and regulations comparable to those now effective in Pennsylvania.

In discussing the "rights and wrongs" of cannery waste treatment it seems well to begin by describing a system which, in the opinion of the writers, is as nearly a satisfactory solution to the problem as exists in Pennsylvania.

At Hanover, York County, Penna., the Hanover Canning Co. operates over practically the entire year in canning peas, string beans, tomatoes, lima beans, puree, catsup, and dry pack. The total pack of an average year is some 1,150,000 cases (equivalent 24—No. 2's). A maximum daily pack

*Presented before the Pennsylvania Chemical Society, Harrisburg, Pa., March, 1948.

The Senior Author

of peas is 11,000 cases and of tomatoes 7,000 cases. The plant employs 750 persons during the four months of maximum production and about 160 during the eight months of slack production.

The water supply, for all purposes, in this cannery is taken from 5 drilled wells. Sanitary sewage, estimated as varying from 2,000 to 10,000 gals. per day, is successfully disposed of by subsurface absorption. The industrial waste waters, varying from a minimum of 190,000 gal. to a maximum of about 440,000 gal. per day, are entirely discharged to the waste treatment system developed during recent years.

Description of Plant

All the waste waters are collected in a single pipe and flow by gravity to a revolving cylindrical screen of ⅛-in. mesh. Trailers are spotted at the screen to receive screenings by gravity and are hauled by tractor for distribution of the solids on the nearby fields of the company.

From the screen the liquid wastes flow directly to either or both of two adjacent concrete settling tanks, each 50 ft. long, 12 ft. wide and about 3 ft. deep. These tanks afford a theoretical detention period of approximately 1½ hours at maximum production rate. A depressed roadway is provided at the effluent end of the basins to permit gravity discharge of settled solids or sludge to tank carts for disposal on fields. During peak seasons it is sometimes necessary to remove and haul sludge as often as every three days but in slack season sludge removal is necessary only once each week or even less frequently. A depth of sludge of about 12 inches is the normal accumulation before cleaning.

From the settling tanks the wastes flow by flume to the first of a series of five earthen lagoons. The five lagoons have a total capacity of some 2½ million gallons and provide a total detention period of approximately 10 days when the plant is operating at its maximum rate as continuously as practicable.

To the effluent of the settling tanks and before entering the first lagoon there is added, during the fresh vegetable season, solutions of soda ash and sodium nitrate to prevent anaerobic decomposition which produces the foul odors commonly asso-

View of Lagoons with Rear of Cannery in Background

Irrigation Sprays in Operation

ciated with stale cannery wastes. Analysis of typical samples taken during the fresh vegetable season has produced results approximating the following:—

	pH	Nitrates ppm.	B.O.D. ppm.
Raw screened wastes	5.0 to 6.8	.....	.....
Settling tank effluent	4.0 to 6.4	.....	.....
Lagoon #5 effluent	6.7 to 8.2	10±	200±

No systematic technical control of the chemical treatment has been established although it is admittedly desirable for economical use of chemicals as well as to insure effectiveness in odor control. A very simple observation, however, appears to afford a fair index of effectiveness. If the waste water in lagoon No. 5 is green from chlorophyl-bearing organisms there is practically no odor but if the water becomes a dirty black, odors develop rapidly unless the nitrate dosage is increased. If the green coloration is visible in Lagoon No. 4 this serves as visual evidence that the nitrate treatment is excessive and can be reduced.

Nitrate Requirement

The nitrate treatment during 1947 averaged about 60 pounds per thousand cases of fresh vegetables packed and the soda ash treatment averaged about 16.5 pounds per thousand cases. The total chemical consumption for the 1947 summer season was 22 tons of nitrate and 6 tons of soda ash.

Until recently a part of the waste waters in Lagoon No. 5 have been pumped by a portable gasoline pump of 1,000 gpm. capacity through demountable piping to irrigating sprinklers in nearby fields where late string beans are grown. Whenever permissible some of the clarified waste from this lagoon has been discharged at a regulated rate through an orifice box to a small stream at times when the stream flow is greater than normal due to rains. This discharge to the stream was, either rightly or wrongly, suspected as being responsible for occasional fish killing, and the chronic complaints of the Fish Warden and engineers of the Department of Health led to the development of the present system which permits no waste waters to discharge to the stream.

In addition to the portable irrigation system from Lagoon No. 5, a 4-in. gravity fibre pipe has been laid a distance of 2400 ft. to an irrigation reservoir of approximately 725,000 gal. capacity. This basin is in an excavation and is located adjacent to a stream in which a small dam, with removable flash board, has been constructed and a one-way pipe permits stream water to be admitted to the reservoir but does not permit wastes to enter the stream. A permanent electrically operated pump of 1000 gpm. capacity is installed in a substantial building at this basin and permanent sub-surface piping extends to several points in the adjacent acreage of the company. Portable piping and 62 Skinner revolving nozzles permit disposal of the entire volume of waste water, through both pumps, to 175 acres of crop land and 25 acres of waste land, with no discharge whatsoever to the stream. The irrigation systems are operated at about 90 pounds line pressure and each spray nozzle covers about 280 square feet.

Fear that an excess of nitrate in the waste waters might injure crop foliage led to a study to determine the tolerance of bean plants to this. Test plots were watered with solutions of 10, 20, 40, 60, 80 and 100 ppm. sodium nitrate. There was no effect at treatment up to 60 ppm., stunted growth but no severe burning at 80 ppm. and severe burning at 100 ppm. These values are far higher than the 10 ppm. nitrate content expected in Lagoon No. 5. Presumably, the residual nitrate and the organic content of the waste waters as applied for irrigation should be beneficial to growing crops.

Improvements in Order

This waste water disposal system of Hanover Canning Co. may be considered perfect for prevention of stream pollution but there are several features which could well be improved for economy and convenience. The ⅛-in. mesh screen is too coarse and permits excessive solids to pass to the settling tanks and thereby requires the hauling to fields of unnecessarily large volumes of soupy sludge. Installation of more efficient screens with about 30 mesh wires would produce more relatively dry screenings and less watery sludge, thus appreciably reducing the needless hauling of water to the fields.

Since this cannery now operates during almost the entire year it would be justifiable, if replacing the settling tanks, to install a single settling unit provided with a modern mechanical sludge removal device and, possibly, a sludge concentrating and dewatering tank. Such facilities would permit sludge removal during continuous operation of the settling tank, would reduce the sludge hauling problem and would prevent septic action in the settling tanks with resultant discharge to the lagoons of settleable solids which increase the septic action and potential odors in those basins. Reduction of solids discharged to the lagoons would also minimize the periodic cleaning of these basins and, furthermore, should reduce the required dose of sodium nitrate to control odors.

Lagoon Design

A common and often satisfactory method of treating cannery wastes is by discharge to lagoons capable of retaining the wastes for the entire season and, after stabilization over the winter, decanting the supernatant liquid, at a properly controlled rate, to a nearby stream during periods of early spring freshets. There are several important features which must be recognized if such systems are to be successful.

A cannery which operates over a long season with a variety of vegetables will require tremendous lagoon

capacity. Excessive solids in the waste waters will cause heavy sludge deposits which are more difficult and expensive to remove from lagoons than if the solids are first removed by screens alone or followed by settling and routinely disposed of while fresh. Very objectionable odors are certain to develop in lagoons unless sodium nitrate in amounts of from 20 to 60 or more pounds per thousand cases processed, depending on the kind and strength of wastes, is added regularly. Failure of embankments due to muskrat activities is a common cause of sudden and disastrous release of large volumes of wastes. Also, admission of surface water must be prevented to make the lagoon capacity fully available for waste waters.

Narrow and steep lagoon embankments invite trouble. A width of 5 or 6 feet at the top should be a minimum and slopes should be about 1½ to 1 to prevent slippage. It would be well to make embankments of very large lagoons wide enough for a roadway to permit passage of a service truck. Thick embankments and smooth slopes with unremitting control of weed and grass growth will discourage muskrats and cause them to move elsewhere, according to an authority in the Pennsylvania Game Commission, but daily inspection and maintenance is still imperative to insure against accidents resulting in heavy penalties for stream pollution. The use of lumber as a core or reinforcing for embankments is not recommended because wood will rot in a few years and become weaker than well compacted earth.

Where lagoon capacity is limited and land area is available it would appear most advantageous to pump the lagooned wastes through irrigation sprinkling systems to the surface of the ground, changing the location of the sprinklers to prevent undue waterlogging or direct overflow to a stream. Surface oxidation is undoubtedly effective in consuming organic matter and lagoon capacity may be gained by such disposal.

Considerable has been written about the use of trickling filters for treating cannery wastes but it is doubtful if such filters can be fully successful unless accompanied by quite large storage lagoons to permit gradual ripening of the filter, dilution of strong wastes with weaker filtered wastes, multiple recirculation through the filter, constant operation even when cannery operations are suspended and sedimentation of solids unloaded from the filter. Obviously, primary removal of most settleable solids is essential to prevent clogging of the filter. It is also probable that satisfactory results cannot be secured without addition of artificial nutrients to maintain the proper biological balance in the filter. The writers have yet to see a fully satisfactory cannery waste disposal system employing trickling filtration although it seems possible to develop such a system, provided considerable storage capacity is available.

Chemical Coagulation

Chemical coagulation and sedimentation of cannery wastes has been practiced with some success but B. O. D. reductions secured are generally not sufficient, when economically practicable chemicals are employed, to satisfy the high standards becoming common in many states. The senior author of this paper designed a tomato products cannery waste treatment works comprising fine screens, dry lime feeder, flash mixing and coagulating tank, sedimentation tanks with 2-hour detention period, final flow regulating basin and sludge drying beds. Due to lack of waste water data for the preceding season and the requirement that the works be completed and operating in the ensuing season the basis of design was entirely speculative and was influenced considerably by the recollections of the management. Fortunately, the first season of plant operation found the tomato crop light and the treatment works, with lime treatment 40 to 50 ppm. and resultant pH over 10, produced a well clarified effluent with B. O. D. reduction of about 50 per cent and very slight effect on the receiving stream. The next season produced a heavy tomato crop and the plant operations caused such overloading of the treatment works and impairment of the stream that it was necessary to double the size of the treatment works. Contrary to admonitions to the management, the company tried to take advantage in the succeeding year of a phenomenal local tomato crop and, notwithstanding performance of the treatment works up to its expectancy, the receiving stream was so burdened with the excessive discharge of residual organic matter in solution that heavy fungus growths developed. The fragments of this growth floated downstream about 5 miles to a popular swimming hole where the complaints of parents became so vociferous about the slimy fungus in the hair of their offspring that the state authorities ordered abatement to a degree that seems almost impossible to attain, particularly because of the lack of area for lagoons or irrigation. The moral of

Irrigation Storage Basin
(Receives Waste from Lagoon No. 5)

Waste Treatment Facilities
(Right—Settling tanks and chemical dosing shed; lagoons center; pipe to irrigation storage basin in distance.)

this is that a cannery *can* become too large for its location.

Sand Filtration

Another method of cannery waste treatment which is capable of excellent performance under certain conditions is that of preliminary removal of gross suspended solids and intermittent sand filtration. At a cannery packing whole-kernel corn the treatment works provided fine screening, one-hour plain sedimentation, intermittent sand filtration at a rate of 100,000 gal. per acre per day and drying of settled solids on a sludge bed having an area 10 per cent of the intermittent sand filters. A reduction of 85 per cent in B. O. D. was attained in this plant but the two filters finally became matted with starch jelly which would not dry rapidly enough for removal. Addition of a third filter unit would probably make this treatment plant sufficiently flexible to operate successfully over the entire 5 or 6 weeks of the corn canning season but it is doubtful that this type of treatment would be economically applicable for strong full-line cannery wastes over a long season because of cumulative clogging of the filters without sufficient rest periods for drying and removal of the clogging materials from the surface.

In Summary

In summarizing on general current practice in the treatment of cannery wastes it must be recognized that these wastes differ widely in character and volume at different establishments and that stream and neighborhood conditions are controlling factors. The method of waste water treatment must be established with all factors in mind but certain quite positive conclusions can be drawn.

1—Fine screening of waste waters is most important as it is easier and cheaper to dispose of solids as garbage than to be faced with the task of removing excessive volumes of soupy sludge from manually cleaned settling basins.

2—Sedimentation of suspended solids in settling basins reduces the decomposible solids discharged to lagoons, thus reducing the odor potential as well as the demand for expensive nitrate as a stabilizing agent.

3—Lagooning of waste waters without creation of local nuisance is entirely practicable provided a sufficient area is available for lagoons of ample capacity to retain the entire volume of wastes for the operating season.

4—Lagoon embankments must be wide, well compacted, trimmed and maintained by daily patrol.

5—Lagoon capacities can be reduced and cannery operations expanded if ample nearby acreage is available for disposal of wastes by a sprinkler irrigating system.

6—No cannery should be so located as to discharge waste waters to a small stream unless ample adjoining land is available for settling basins and adequate lagoons as there has not yet been developed a practical method for treating cannery waste waters in a compact plant which will dependably produce an effluent of quality to meet present requirements of state agencies controlling stream pollution.

American Water Works Co. Makes Personnel Shifts

Since the American Water Works Co. was acquired by the Northeastern Water Co. last October, a number of shifts in management have been made.

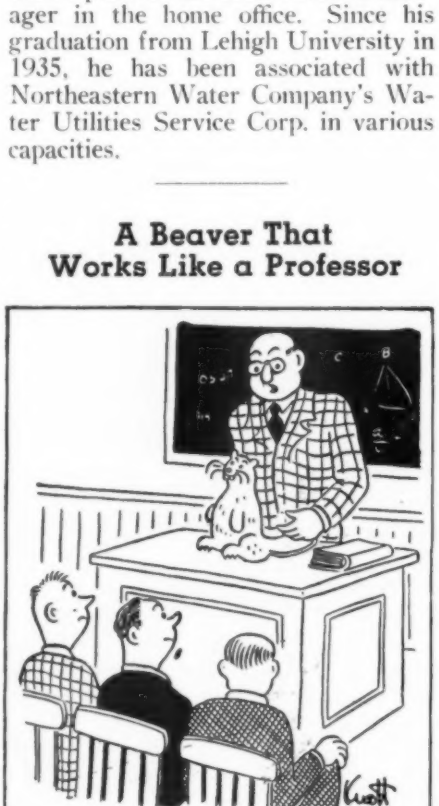
Mr. John H. Ware, who was the principal owner of Northeastern Water Co., has become chairman of the board and president of the American Water Works Co. Vice presidents include Lawrence T. Reinicker and John J. Barr. These men serve Northeastern in a similar capacity. Reinicker has been in waterworks for a number of years, having started after World War I with the Bureau of Water Supply in Baltimore.

Jack Barr has been in the water works industry for all his working life and has been associated during that time with Mr. Ware. Beginning many years ago as a meter reader and collector in a southern New Jersey water property, he worked his way up to become vice president and treasurer of Northeastern Water Co.

The American Water Works Co. has also announced certain changes in office management properties. Lisle G. Hall, who was assistant division manager, was named manager at the Terre Haute plant to fill the vacancy left by the resignation of William H. Streit who returned to New England to become sales manager and public relations director of a Providence, R.I. firm. Mr. Hall has been a water works man since 1915 and was graduated from the University of Illinois when he joined Peoria's staff.

John W. Heiney will take Mr. Hall's place as assistant division manager in the home office. Since his graduation from Lehigh University in 1935, he has been associated with Northeastern Water Company's Water Utilities Service Corp. in various capacities.

A Beaver That Works Like a Professor



". . . . and now for a practical demonstration in the building of dams."

WHEN WILDCATS FIGHT

The frost gems flashed like twinkling stars,
The silvery moon made all things bright,
As Santa Claus, with shocks and jars,
Watched two wild bob cats stage a fight.

When wild cats fight it isn't nice.
Rampant they spring and claw and tear.
One was named *WAGE*, the other *PRICE*.
They climbed each other through the air.

Wage jumped on Price, then Price jumped high.
Each jumped on other. What a fight!
Scratching and clawing to the sky,
Old Santa watched them out of sight.

Upheld by only thin moonbeams,
The silly things must surely fall,
Like idle fancies—shattered dreams—
Some people will be hurt—That's all.

So: Profiteers and racket men,
And Politicians, Dupes and Scholars:—
Poor DOLLARS cannot do for MEN
More than *MEN* will do for *DOLLARS*.

ROSCOE R. HOWARD.*

**Supt. of Water, Slater, Mo. ("Bard of the Missouri Conference")*

Ed. Note: This bit of verse was developed by Mr. Howard, for his Christmas Card—1947. Since it is still timely we are printing it.

Ground Water Level Falls in England

The ground water level in England, particularly in and about London, has been falling for a hundred years or more. This is evidenced by the fact that wells at Chiswick, Fulham, and Hammersmith now have a water level of approximately 250 feet below ground level, whereas a hundred years ago these were artesian wells with a natural flow.

TRICKLING FILTERS FOR TREATING PULP AND PAPER MILL WASTES

Part I—Alkaline Wastes

by

HARRY W. GEHM,

Technical Advisor

NATIONAL COUNCIL FOR STREAM IMPROVEMENT OF THE PULP, PAPER AND PAPER BOARD INDUSTRIES, INC., NEW YORK CITY

THE ability of the trickling filter to oxidize dissolved organic matter, together with its stability under inimical conditions, of fluctuating load and overload appears to make this an ideal device for treating trade wastes of certain types. The developments of high rate and dual stage filtration, together with a number of new construction and operating technics, have also served to broaden its application. Hence, in the case of quite a number of wastes, the trickling filter has become an established and reliable treatment device.

In consideration of these facts a determined effort has been made during recent years, both in this country and in England, to use these filters for the treatment of pulp and paper wastes. In England most attention has been given mixed wastes, while in this country, sulfite liquor, kraft-mill waste and strawboard effluents have been selected for study since these wastes contain high proportions of dissolved and highly dispersed organic matter. They also represent major pollution problems of the industry. Some exploratory research has also been done on de-inking waste. As a preliminary consideration it was obvious that if this device was to provide an acceptable treatment method for these wastes, considerably higher efficiencies would have to be obtained than those recorded for most other wastes. This consideration was based on the fact that about 800 pounds of B.O.D. (5-day) are contained in the waste liquor produced by the manufacture of one ton of sulfite pulp and about 200 pounds from the same quantity of strawboard. Thus, at 1.5 lb. loadings per cubic yard per day, 513 cubic yards of filter media would be required per ton of sulfite pulp produced and 133 cu. yds. per ton of strawboard. As sulfite pulp mills vary in production capacity from about 50 to 600 tons daily and strawboard mills from 35 to over 100 tons daily, the enormity of filter installations required at such loadings, can readily be projected. Therefore the major effort behind the investigations has been toward the attainment of higher loadings than those which constitute present practice for other wastes. If these higher loadings are unobtainable, the filters would be even more impractical as a method of treatment than they are now considered for the treatment of sanitary sewage for large cities.

The Author

Because of the length of Part I, it is necessary to divide it between two issues. The first section of Part I appears herewith; the second section will appear in the July issue and will contain the summary and references. Part II will follow in a section will appear in the July issue

STRAWBOARD WASTE

A very complete search of the literature uncovered but three references of any consequence in respect to treatment of strawboard waste by aerobic decomposition. Phelps[1] reported on experiments employing slow sand filtration as far back as 1906. He states that a clear filtrate was obtained at a rate of application of 100,000 gallons per acre per day. Some data regarding operation of a trickling filter on straw pulping waste were found in the 9th Report of the Royal Commission on Sewage Disposal published in 1915.[2] Results from a filter eight feet in depth yielded average B.O.D. reductions of 43 per cent. Individual test figures were highly variable, however. Hommon[3] in 1918 employed a biological filter containing cinder media, and he claimed that a highly purified effluent was obtained at loadings which are estimated at 0.1 pound of B.O.D. per cubic yard per day. Un-

Trickling Filter Pilot Plant for Strawboard Wastes, Terre Haute, Ind.

fortunately, both the American studies antidated use of the B.O.D. test here and were of little value for performance evaluation. They were, however, indicative that strawboard waste is susceptible to aerobic decomposition. Laboratory tests conducted by Prof. Bloodgood[1] [2] at Purdue University confirmed this. Both trickling filter and activated sludge studies conducted in the laboratory revealed that if sufficient treatment time was allowed, practically complete purification could be obtained. No inhibitory substances appeared to be present in the waste, since B.O.D. rate curves exhibited no consistent lag. The only substance which appeared as a possible limiting factor was the nitrogen content of the waste. This nitrogen content was decidedly below the optimum suggested by Lea and Nichols[6] for aerobic oxidation as Bloodgood and Erganian[7] have pointed out. Hence, it was believed that nitrogen supplementation would likely be necessary if maximum oxidation rates were to be obtained.

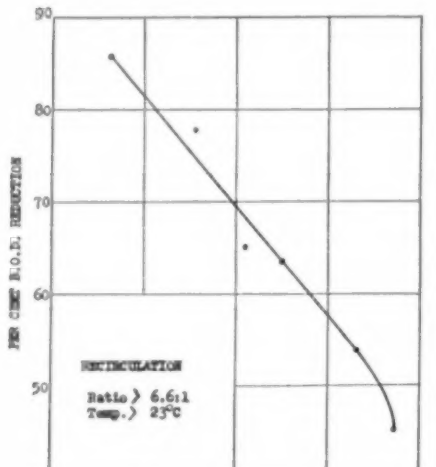


Fig. 1. Strawboard Waste—Per Cent B.O.D. Reduction Plotted Against B.O.D. Loading.

Bloodgood and Stahl[8] operated a trickling filter pilot plant (shown in one of the accompanying illustrations) for a period of about eight months. Detailed data covering this operation are published in research bulletins of the NCSI[4] [5]. Results on B.O.D. reduction are summarized in Table I, in which averages for periods of operation under various conditions are presented. Throughout each run few significant deviations from the average values were observed, since conditions were held as constant as facilities permitted.

Since it had been previously pointed out that nitrogen was present in such low concentrations in strawboard waste as to be a possible limiting factor in microbial decomposition, a comparison was made of three test runs; to one no supplemental nitrogen was added, to another sodium nitrate, and to a third ammonium sulfate was added. Other factors known to effect the results obtained were relatively constant for the three periods. Examination of filter performance for these periods (runs number 4, 5 and 6 in Table I) indicate that while a greater reduction of B.O.D. was recorded on addition of sodium nitrate than when no nitrogen salt was added, the ammonium sulfate run yielded a lower reduction than the control run. It is probable that the variations in reduction observed are within the experimental error of the tests and the conclusion reached was that nitrogen content was not a limiting factor in microbial oxidation of this waste. If the high reduction obtained with sodium nitrate is significant, the results could be more logically attributed to the oxygen contributed by it rather than to the nitrogen.

Table II

EFFECT OF TEMPERATURE ON STRAWBOARD FILTER EFFICIENCY

Days of Test	Recirculation Temp.	Recirculation Ratio	Loading lb./Cu. Yd. per Day	Percent B.O.D. Reduction
55	19	12.0	1.22	36.6
51	28	9.3	1.22	72.4

It will be noted on examination of Table I that the factors of temperature, recirculation and loading affected the total reductions obtained and the character of the effluent appreciably. Periods of operation were selected from the data in which two of these variables were relatively constant and the third at two or more levels, so that evaluation of the importance of each could be made.

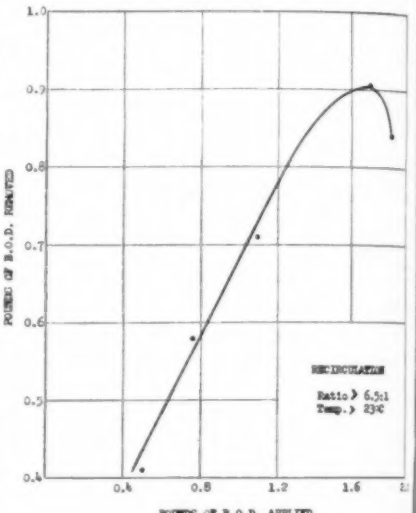


Fig. 2. Strawboard Waste—Pounds B.O.D. Removed Plotted Against B.O.D. Loading.

The first of these variables, temperature, had a very marked effect on filter performance. While sufficient data with all other factors constant was not available to establish a temperature curve, the tabulation of two lengthy test periods averaging a nine-degree centigrade temperature differential serve to illustrate this fact. (Table II.)

It will be noted that the nine degree drop from 28 degrees C. caused the B.O.D. removal to drop to half of that at the higher temperature. This appears to be an unusually high reduction in performance in this range as compared to that normally expected. Hence, the established formulations for the effect of temperature on this type of decomposi-

Table I

SUMMARY OF B.O.D. REDUCTIONS EFFECTED BY STRAWBOARD WASTE T. F. UNDER VARIOUS CONDITIONS OF OPERATION

Run No.	Days of Test	Rate of Application M.G.A.D.	Recirc. Ratio	Temp. °C.	B.O.D. (5-day) ppm. Loading lb./Cu Yd. per Day	% Reduction by Filter	Filt. Inf.	Filt. Eff.	Added Nitrogen
1	16	19.4	18.9	23	0.76	77.0	906	208	None
2	13	19.7	11.8	26	1.09	65.3	818	284	None
3	13	19.7	9.1	28	1.34	66.8	794	264	None
4	25	19.2	9.3	28	1.22	73.9	757	198	None
5	13	19.6	9.3	28	1.23	78.1	746	164	$NaNO_3$
6	13	19.9	9.3	28	1.20	65.1	718	251	$(NH_4)_2SO_4$
7	13	19.9	9.4	27	1.71	53.0	753	354	None
8	23	19.6	22.6	25	0.50	81.6	764	139	None
9	13	19.9	6.6	26	1.86	45.0	822	452	None
10	14	7.3	2.9	26	1.34	28.8	850	605	None
11	16	11.5	5.0	22	1.49	33.8	898	595	None
12	10	9.4	5.0	21	1.15	34.9	857	558	None
13	20	19.4	12.0	20	1.12	36.4	871	554	None
14	9	22.7	11.9	18	1.39	32.9	918	616	None
15	26	19.4	12.2	18	1.13	40.6	889	528	None

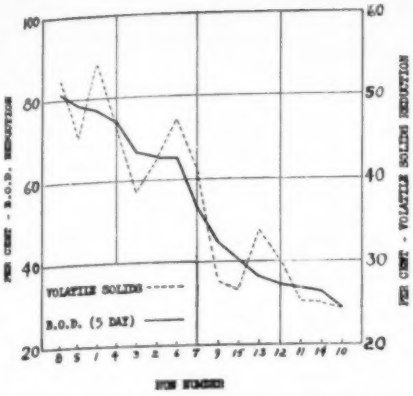


Fig. 3. Strawboard Waste—Relation Between B.O.D. Reduction and Removal of Volatile Solids.

tion may not be as generally applicable as they are now considered to be.

The second variable, recirculation, appeared to be of relatively little importance if maintained above a critical level. If allowed to go too low, however, extremely serious reduction in filter efficiency resulted. This can be seen by comparison of runs 3 and 10, where the ratios were 9.1:1 and 2.9:1 yielding B.O.D. removals of 66.8 per cent and 28.8 per cent respectively. Run 9 is also of interest in this respect, since at the high loading of 1.86 pounds and a ratio of 6.6:1, removal was still 45 per cent. This reduction leads to the conclusion that the 6.6:1 ratio was adequate to allow maximum performance. It thus appears that for maximum oxidation rates the B.O.D. of the liquor in the process of treatment should not exceed 500 ppm. This dilution factor may be responsible for the unusually high effect of temperature observed, since at the lower oxidation rates at low temperatures, the B.O.D. of the system liquor builds up irrespective of high recirculation rates. This effect is obvious from the B.O.D. data for runs 13, 14 and 15. At temperatures below 20 deg. C. and at recirculation ratios above 11.9:1 system liquor B.O.D. values exceed 500 ppm. consistently.

It was thought possible that pH value might be a factor involved with the dilution effect of recirculation and might better explain the requirement that a minimum concentration level be maintained, since the pH of the raw waste ran fairly high at times. A check, however, of the voluminous data collected on pH values throughout the system showed that pH was not involved.

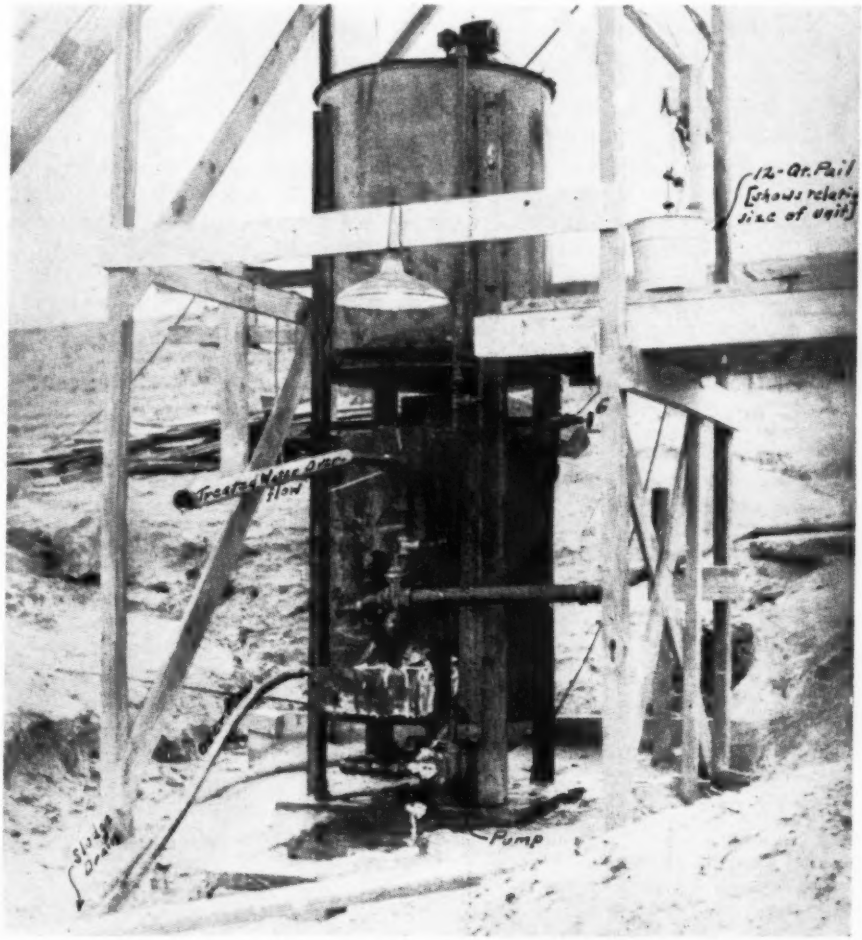
The last variable segregated was that of B.O.D. loading. Results of individual runs at which the temperature exceeded 23 deg. C. and the recirculation ratio exceeded 6.6 to 1 were selected, and the percentage of B.O.D. reduction plotted against the loading values as shown in Fig. 1. The curve obtained indicated that the relationship between these factors was linear, the reduction decreasing proportionately with the loading, until a loading in excess of 1.57 pounds per cu. yd. per day was reached. Beyond this point indications were that the percentage B.O.D. reductions took a rapid drop. Irrespective of the percentage removal obtained, the maximum oxidation rate was observed at about 1.7 pound B.O.D. loadings as indicated by inspection of Fig. 2, in which pounds of B.O.D. removed are plotted against loading. At this level of efficiency, B.O.D. reductions in excess of fifty per cent were obtained, and produced an effluent containing about 350 ppm. B.O.D.

The concentration of suspended solids in the raw waste delivered to the precipitator type presettling unit averaged 835 ppm. throughout the entire operating period. In Table III, the percentage removals of both total and volatile suspended solids are tabulated for the precipitator and the filter itself. Of major interest is the relatively high reductions of suspended matter effected by the filter, including the humus tank. This is believed to be due to the coagulating effect of the filter on much of the finely dispersed matter, in which this waste is rich. It is probable that most of the B.O.D. remaining unoxidized or coagulated by the filter when operating at good efficiency is in true solution. Proof of this is difficult, due to the empirical nature of

Table III

REDUCTION OF SUSPENDED SOLIDS BY PRESEDIMENTATION AND TRICKLING FILTER

Run No.	Per cent Reduction by Presedimentation		Per cent Reduction by Overall Treatment	
	Total Susp. Solids	Volatile Susp. Solids	Total Susp. Solids	Volatile Susp. Solids
1	43.5	39.2	90.5	90.3
2	44.8	42.9	91.8	82.7
3	60.8	61.1	84.7	83.9
4	54.0	57.8	89.9	88.8
5	58.1	60.6	90.5	88.7
6	58.5	58.6	91.7	90.1
7	55.2	56.2	90.5	90.1
8	56.8	58.1	93.5	91.2
9	54.7	55.3	81.8	80.2
10	55.6	57.5	81.4	80.5
11	53.4	52.3	83.7	82.4
12	49.0	49.9	84.0	83.0
13	51.2	53.2	82.8	82.5
14	64.0	64.0	84.5	82.9
15	68.4	68.2	81.0	78.5



Experimental Trickling Filter Operating on Kraft Mill Waste—Louisiana.

the suspended solids test when applied to wastes containing substances highly dispersed.

Relation between B.O.D. reduction and the removal of volatile solids is expressed in Fig. 3. While individual volatile solids figures are quite variable with respect to the B.O.D., the two trends are very similar. The variability might well be due to errors inherent to the total solids determination.

KRAFT MILL WASTE

Since kraft pulp mill effluents generally contain substances such as alkali, inimical to biological decomposition, dilution to a concentration below 300 ppm. B.O.D. is generally required before such decomposition can proceed. Another difficulty encountered is the variation in strength

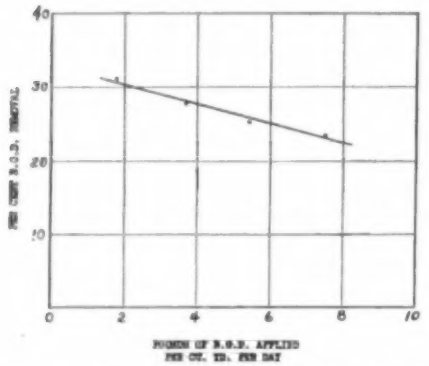


Fig. 4. Kraft Mill Waste—Per Cent B.O.D. Reduction Plotted Against B.O.D. Loading.

of the waste from various unit operations. These difficulties can be overcome by dilution with papermill effluent when available and equalization in a detention basin. The high dilution required, however, generally

Table IV

ANALYSIS OF EQUALIZED BLEACHED KRAFT PAPER MILL EFFLUENT—PPM.

pH	7.6
Oxygen Consumed	140
B.O.D. (5-day) Average	117
Maximum	128
Minimum	102
Total Solids	753
Susp. Solids	32
Volatile	10
Dissolved Solids	731
Volatile	320
Total Alkalinity	296

reduces the temperature of the waste to a considerable degree and requires facilities for handling very large flows.

The literature contains two papers by Davis[9] [30], describing a pilot plant study made at a large bleached kraft paper mill from which all the wastes were collected in a storage basin. The discharge from this basin was of dilute and uniform nature, the analysis presented in Table IV being representative of its character.

Table V

KRAFT MILL WASTE

Run No.	Application Rate M.G.A.D.	Recirculation Ratio	Loading lb./Cu. Yd. per Day	% B.O.D. Reduction	ppm. B.O.D. Inf.	ppm. B.O.D. Eff.
1	40.0	8	0.93	33.3	122	81
2	17.8	1	1.78	31.5	116	80
3	35.5	3	1.83	30.6	118	82
4	53.3	5	1.77	32.6	116	79
5	71.0	7	1.77	29.4	115	81
6	35.5	1	3.71	25.3	119	86
7	53.3	2	3.54	26.5	116	85
8	71.0	3	3.85	31.7	125	86
9	35.5	1/3	5.74	20.5	123	97
10	53.3	1	5.37	24.8	117	88
11	71.0	5/3	5.42	30.1	118	83
12	53.3	1/2	7.21	20.3	116	93
13	71.0	1	7.06	30.4	114	79
14	53.3	1/5	7.68	22.8	110	85
15	71.0	3/5	8.03	20.7	106	83

Average Temperature of Waste—14° C.

This analysis is not far different from that of the sanitary sewage of a large municipality. This waste, however, does not represent as balanced and readily available microbial diet as does sewage, since it is sparse in nitrogen content and contains some substances known to be slowly decomposable by bacteria. Some substances toxic to bacteria are also present but at the dilution dealt with in the experiment summarized here their concentration was probably below the effective concentration.

Table V represents a summary of the most pertinent data of Davis' studies. In none of these tests was supplemental nitrogen employed. It would have been better had the experiments been conducted at a higher temperature, but it was necessary for the process to be successful at the test temperature in order to be applicable to the problem of the mill at which the pilot plant was operated. Nevertheless, the data are indicative of filter performance on this waste and the increase in efficiency obtainable at higher temperatures can likely be safely projected.

In order to evaluate the effect of recirculation at various loadings the tabulation shown in Table VI in which various ratios at different loadings are compared to B.O.D. reductions was prepared. From this it was judged that no advantage in efficiency could be attributed to any degree of recirculation.

Plotting percentage B.O.D. reduction against loading yielded the curve presented in Fig. 4. It is evident from this plot that a linear relationship exists. With the optimum

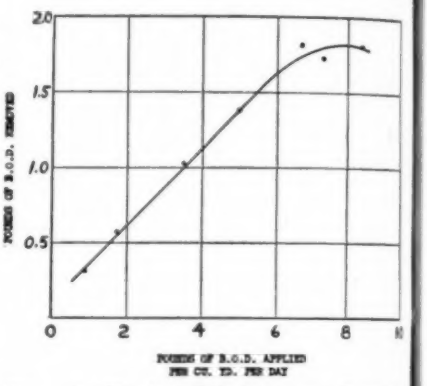


Fig. 5. Kraft Mill Waste—Pounds B.O.D. Removed Plotted Against B.O.D. Loading

reduction being but 31 per cent at a 1.8 pound loading, the reduction dropped but 9 per cent when the loading was boosted to over 8 pounds. This may be an indication of either a limited nitrogen supply or the presence in this waste of a limited amount very readily oxidizable matter as compared to a greater percentage of resistant material.

When reduction in B.O.D. in terms of pounds were plotted against loading (in Fig. 5) a linear relationship was evident until a six-pound loading was applied, after which the curve flattened abruptly with reduc-

Table VI

EFFECT OF RECIRCULATION ON B.O.D. REDUCTION OF KRAFT MILL WASTE

Average Loading—lb. B.O.D. Per Cu. Yd. Per Day							
1.79		3.70		5.48		7.49	
Ratio	lb. B.O.D. Reduction	Ratio	lb. B.O.D. Reduction	Ratio	lb. B.O.D. Reduction	Ratio	lb. B.O.D. Reduction
1	0.56	1	0.94	0.33	1.18	0.2	1.74
3	0.56	2	0.94	1.00	1.34	0.5	1.46
5	0.57	3	1.21	1.66	1.63	1.00	2.14
7	0.52	--	-----	-----	-----	1.66	1.65

tions failing to increase at loadings exceeding eight pounds. The fact that maximum efficiency is reached at so high a loading is additional evidence supporting the contention that the waste contains a limited percentage of substances readily amenable to microbial oxidation. It is believed that the filter is effective only on these substances, assimilating but to a small degree the remaining resistant constituents of the waste.

(Part I will be continued in the next issue)

CHEMICAL ENGINEERS HOLD SESSIONS ON INDUSTRIAL WASTE

AT THE regional meeting of the American Institute of Chemical Engineers, held in Cleveland, Ohio, on May 9-12, two sessions were devoted to discussions of industrial waste and stream pollution. Both sessions were presided over by R. D. Hoak, Senior Fellow of Mellon Institute.

The first session was opened with a paper on *"Stream Pollution Control in Indiana,"* presented by B. A. Poole, Chief Engineer of the Indiana Dept. of Health, and Technical Secretary of the Indiana Stream Pollution Control Board. Mr. Poole explained the anti-pollution laws in Indiana and how they provide for a seven-man Stream Pollution Control Board. The operation of the Board was described more or less in detail and Mr. Poole explained the reasonableness of the attitude of the Board in the administration of the law. The Indiana Board recognizes that economics must be considered where the expenditure of public and private funds is involved. It tries to impel rather than to compel, by cooperating with industry and municipality alike. The Board recognizes the need for research in certain fields and encourages industry to initiate research. It is willing to await the outcome of such studies if they appear likely to provide suitable means of treatment. Work now planned for the augmentation of municipal sewage treatment plants in Indiana will involve an expenditure of some $35,000,000.

R. P. Farrell, Tennessee Dept. of Public Health, Nashville, Tenn., spoke on the *"Unified Administrative Control of Stream Pollution in Tennessee."* The Tennessee law provides for a Control Board with wide representation and broad powers to insure unified administration of stream pollution control activities. The Tennessee program has set up central and field laboratory facilities and a technical staff; and carries on surveys of existing stream pollution problems, studies of streams, and special cooperative studies with Tennessee Valley Authority, etc.

Three steps are recommended for correction of pollution: First, study and surveys to determine amount and character of pollution and methods of correction; second, preparation of plans and specifications and arranging for financing of corrective works; and third, the construction and putting into effective operation of treatment facilities.

John Boardman, Engineer, Interstate Commission on the Delaware River Basin, better known as Incodel, spoke on *"Interstate Cooperation in Stream Pollution Abatement."* He explained the organization of Incodel and how it was set up with the cooperation and advice of the four state departments of health of New York, New Jersey, Pennsylvania, and Delaware.

Mr. Boardman explained how a comprehensive action program for bringing about the restoration of the river to its most effective economic purpose is now under way.

Management's Interest

"Management's Interest in Stream Pollution Problems" was discussed by Mark E. Putnam, Vice Pres. of the Dow Chemical Co., Midland, Mich. Mr. Putnam pointed out that general decrease in ground water resources has forced growing industries and municipalities to make an increased use of surface waters for water supply. Such usage demands better control of waste waters, and management has a duty not only to the industry involved, but to industry generally, to use its superior facilities to study the problems, according to Mr. Putnam, who outlined means by which this duty can be discharged, together with some of industry's accomplishments.

Metallurgical Wastes

Harding Bliss, Professor of Chemical Engineering at Yale University, New Haven, Conn., presented *"A Program for the Development of a Waste Disposal Process with Examples from Metallurgical Wastes".*

Professor Bliss outlined five steps which are necessary to be taken to permit the economical solution of a waste disposal problem. These include a complete analytical study of the wastes, their amounts, compositions, etc.; an attempt to reduce pollution at the source or to alter its nature so that ultimate treatment processes may be simplified; research study on the concentration of dilute wastes and the actual treatment of the strong wastes; cost estimating by which selection among potential methods may be facilitated; and pilot plant design, construction, and operation.

Harry D. Unwin of Albert Kahn, Architects & Engineers, Inc., Detroit, Mich., presented a paper on *"Metallurgical Plant Wastes and Their Treatment".*

This paper discussed the approach to and solution of an industrial waste problem in particular reference to the industrial waste treatment system designed and constructed in connection with the ball-bearing plant for the New Departure Division, General Motors Corp., Sandusky, Ohio.

The *"Treatment of Felt Paper Mill Wastes"* from the Congoleum-Nairn plant at Kearny, N.J., was discussed by W. Y. Irwin and A. H. French. Biological treatment was found to be the most suitable method for this type waste under the conditions imposed where the raw waste had a B.O.D. of 1700 to 3500 ppm., and the water entering the stream had to have a B.O.D. of 50 ppm. or less.

Messrs. Irwin and French also discussed experiences obtained in the pilot plant made up of a battery of six bacterial filters to operate on this type of waste. Results permitted definite conclusions to be drawn on the rate of feed, dilution, size, etc., and a full scale plant is under design. It will consist of two half-acre filters in series, with a clarifier following each stage, recirculation being used to keep the B.O.D. concentration within the best operating range.

The presentation of these various papers on industrial waste treatment before chemical engineers shows the growing interest of industry and its technical people in the problems of industrial waste pollution abatement and stream pollution control.

Comments of the Editors

A Great Convention!

FEATURED in this issue, and deservedly so, is the first installment of a report covering the 1948 Convention of the American Water Works Association in Atlantic City, N. J., May 3-7.

The all-time attendance record of 1,704 tells only a part of the story of what made the Atlantic City Convention the success that it was.

It has long been the contention of this writer that a technical program with a variety of timely topics and topics of the greatest interest to the greatest number, or topics of a controversial nature, can always be counted upon to draw record attendances. This much has been repeatedly noted in connection with sectional meetings, and the Atlantic City Convention has supplied an added bit of evidence that the contentions re-stated here are well founded.

An action of some moment in Atlantic City was that of establishing a new division in A.W.W.A., which is to be known as the Water Resources Division. This new division will devote a great amount of attention to ground water problems in general and ground waters as sources of public and industrial water supply, topics deserving of greater emphasis and a better understanding than currently exists. Another action was the consolidation of the old Plant Management and Operation Division and the Financing and Accounting Division into a single division to be known as the Water Works Management Division.

Taking a look at the technical sessions at Atlantic City, and recalling what has been said concerning the drawing power of controversial matters, or topics about which much more needs to be known, one of the best attended and most interesting sessions was that devoted to Public Relations and the need for its advancement in the water supply field.

Another session of major interest proved to be that in which was scheduled a free discussion of what is known and what is *not* known about sulfur jointing compounds, what happens to these compounds under various conditions of application and what the effects of environmental conditions may be on the life expectancy of joints made with sulfur compounds. Much was accomplished in this session which was developed to bring out in the open all that has been more or less whispered about the spotty deterioration of certain sulfur compound joints which has baffled and perplexed a number of water works managers. This so-called "open session" represented a departure in A.W.W.A. program arrangement. It admirably served its designed purpose of bringing before the Water Works Practice Committee and the membership-at-large factual experience of long-time users of sulfur jointing compounds, the results from studies by certain users (as well as researchers and manufacturers), seeking an answer to the problem, and suggestions of remedies from the producers of these useful compounds which have, but for spotty failures or show of deterioration, proven by and large entirely dependable and economically advantageous to the water supply industry. From this session the Water Works Practice Committee gained outspoken expressions from the field at large, on which a sound start can be made in the contemplated development of specifications for pipe jointing compounds.

There was another session which also constituted a departure in A.W.W.A. program arrangement, the interest in which was shown by the fact that this session proved to be the best attended session of any final day session of an A.W.W.A. Convention. Like the session on jointing compounds this closing session was arranged as another "open session" of the Water Works Practice Committee. The purpose was a review of the first draft of a revised text of "Recommended Practice for Inspecting, Repairing and Repainting Elevated Steel Tanks and Water Storage Tanks". An invitation had been sent out to all known tank maintenance and repair companies to attend and file objections or suggested improvements to the Recommended Practice text. Discussions by tank manufacturers, tank owners, and all others interested was also invited. Like the "open session" on jointing compounds, this session on tank maintenance produced information and experience of high value to the Water Works Practice Committee, information and opinions which could otherwise only have been secured with much greater difficulty, expense and delay.

There was no question concerning the popularity with the membership of the two "open sessions," which in reality constituted open hearings by the Water Works Practice Committee on two subjects of widespread interest. There was no question but that this departure from the customary program arrangement proved of high value to all concerned, and it is a pity that every member interested in these subjects could not have been listening in on the open give and take discussion. We will hope that the 1948 program departure will become an annual arrangement. If so, it is our belief that the 1949 Convention in Chicago next spring will see the attendance record broken again. A free and open discussion of controversial topics (off or on the record), can always be counted on not only to attract attendance but also to prove educational to all interested.

We could go on with further detailed praise of the Atlantic City technical program and the quality, the attractiveness and educational features of the equipment exhibits, but prefer to leave the reader of our more detailed reports in this and the next issue to derive his own opinion of the worth and effectiveness of the several always popular Panel Discussions of a number of timely subjects. Such, for instance, were these: "Developing Rate Increases and Preparing the Public for Such"; "Service Extensions to Suburban Areas and Rate Differentials"; "Rates and Regulations for Water Used in Air-Conditioning"; "Water Works Conferences and Operators' Schools"; "Meeting Major Emergencies in Water Supply"; "Public Use of Reservoir Lands and Waters"; "Making Reservoir Lands Pay Off" and others.

Only as second best to sitting in on the discussion and arguments in person, we shall offer what is possible in the way of condensed reporting of the Convention in this and the next issue for the benefit of the absentees, and close with a genuine wish that every reader may find it possible to enjoy the experience of, and profit by, first hand participation in the 1949 Convention next spring in Chicago, to which the writer wishes to extend a personal invitation to every reader of this page.
—L. H. E.

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MEETINGS SCHEDULED

JUNE 18-19—MILWAUKEE, WISC. (Schroeder Hotel)
Central States Sewage Works Association. Sec'y-Treas., Paul W. Reed, 1098 W. Michigan St., Indianapolis, Ind.

JUNE 23-25—DAYTON, OHIO (Dayton-Biltmore Hotel)
Ohio Conference on Sewage Treatment. Sec'y-Treas., G. A. Hall, State Dept. Health, State Dept. Health Bldg., Columbus 15, Ohio.

JULY 14-16—BATON ROUGE, LA. (Geology Bldg., Louisiana State Univ.)
Water & Sewage Works Operators' Short Course. (Eleventh Annual Meeting.) Director, John H. O'Neill, Div. of Public Health Engr., La. State Dept. of Health, New Orleans, La.

AUG. 23-25—CHATTANOOGA, TENN. (Hotel Patton)
Kentucky-Tennessee Section A.W.W.A. Sec'y, R. P. Farrell, 420—6th Ave., N., Nashville 3, Tenn.

AUG. 23-25—STATE COLLEGE, PA. (Nittany Lion Inn)
Pennsylvania Water Works Operators' Association. Sec'y-Treas., I. M. Glace, 1001 Front St., Harrisburg, Pa.

AUG. 25-27—STATE COLLEGE, PA. (Nittany Lion Inn)
Pennsylvania Sewage & Industrial Wastes Association. Sec'y-Treas., Bernard S. Bush, Kirby Health Center, Wilkes-Barre, Pa.

SEPT. 1-2—WINNIPEG, CAN. (Royal Alexandria Hotel)
Minnesota Section A.W.W.A. Sec'y, R. M. Finch, 416 Flour Exchange, Minneapolis, Minn.

SEPT. Date not set—MINOT, NO. DAK.
North Dakota Water & Sewage Works Conference. (20th Annual Convention.) Sec'y-Treas., Jerome H. Svore, State Health Dept., Bismarck, N. Dak.

SEPT. 14-15—DES MOINES, IOWA (Hotel Kirkwood)
Iowa Sewage Works Association. Sec'y-Treas., Leo Holtkamp, P. O. Box 310, Webster City, Iowa.

SEPT. 14-17—NEW YORK, N. Y. (Hotel Pennsylvania)
New England Water Works Association. Sec'y, Joseph C. Knox, 609 Statler Bldg., Boston, Mass.

SEPT. 16-17—CHEYENNE, WYO. (Hotel Plains)
Rocky Mountain Section A.W.W.A. Sec'y, O. J. Ripple, 710 Colorado Bldg., Denver 2, Colo.

SEPT. 22-24—FLINT, MICH. (Hotel Durant)
Michigan Section A.W.W.A. Sec'y, Raymond J. Faust, State Dept. of Health, Lansing, Mich.

SEPT. 22-24—ATLANTA, GA. (Ga., Institute of Technology)
Georgia Water & Sewage Association and **Georgia Water & Sewage Works School** (17th Annual Meeting.) Sec'y, Van P. Enloe, R. F. D. 7, Box 372, Atlanta, Ga.

SEPT. 29-30—CLARKSBURG, W. VA. (Stonewall Jackson Hotel)
West Virginia Section A.W.W.A. Sec'y, John B. Harrington, State Dept. of Health, Charleston, W. Va.

SEPT. 30-OCT. 1—SIOUX FALLS, SO. DAK. (Carpenter Hotel)
South Dakota Water & Sewage Works Conference. Sec'y, W. W. Towne, State Board of Health, Pierre, So. Dakota.

OCT. 5-6—FORT DODGE, IOWA (Hotel Wahkonsa)
Iowa Section A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

MEETINGS SCHEDULED

OCT. 7-8—MANSFIELD, OHIO (Mansfield-Leland Hotel)
Ohio Section A.W.W.A. Sec'y, F. P. Fischer, 812 Perry Payne Bldg., Cleveland 3, Ohio.

OCT. 10-13—GALVESTON, TEXAS (Buccaneer Hotel)
Southwest Section A.W.W.A. Sec'y-Treas., L. A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

OCT. 13-15—ATLANTIC CITY, N. J. (Haddon Hall)
Pennsylvania Water Works Association (52nd Annual Meeting). Sec'y, E. R. Hannum, P. O. Box 315, Windber, Pa.

OCT. 13-15—BOSTON, MASS. (Statler Hotel)
American Society of Civil Engineers. (Fall Meeting.) Asst. Sec'y, Allen Wagner, 33 West 39th Street, New York 18, N. Y.

OCT. 13-15—MONTGOMERY, ALA. (Whitley Hotel)
Alabama-Mississippi Section, A.W.W.A. Sec'y, John L. Snow, First National Bank Bldg., Montgomery, Ala.

OCT. 15-17—PHOENIX, ARIZ.
Arizona Water & Sewage Works Association and Arizona Section A.W.W.A. Sec'y, Helen Rotthaus, Sanitary Engineering Div., State Capitol, Phoenix, Ariz.

OCT. 17-20—BOSTON, MASS. (Copley Plaza Hotel)
Public Works Congress. Executive Director, Donald F. Herrick, American Public Works Association, 1313 East 60th St., Chicago 37, Ill.

OCT. 18-21—DETROIT, MICH. (Statler Hotel)
Michigan Sewage Works Association. Sec'y-Treas., R. J. Smith, 545 Elizabeth St., E. Lansing, Mich.

OCT. 18-21—DETROIT, MICH. (Hotel Statler)
Federation of Sewage Works Associations. Sec'y-Treas., W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.

OCT. 20-22—PHILADELPHIA, PA. (Hotel Sheraton)
4-States Section A.W.W.A. Sec'y, W. A. Welch, 748 Public Ledger Bldg., Philadelphia 6, Pa.
(Joint Meeting)
Western Penna. Section A.W.W.A. Sec'y, L. S. Morgan, State Department of Health, Greensburg, Pa.

OCT. 24-26—JEFFERSON CITY, MO. (Hotel not selected)
Missouri Section A.W.W.A. Sec'y, W. A. Kramer, State Office Bldg., Jefferson City, Mo.

OCT. 25-26—RICHMOND, VA. (Hotel John Marshall)
Virginia Section A.W.W.A. Sec'y, W. H. Shewbridge, 708 State Office Bldg., Richmond 19, Va.

OCT. 27-29—RIVERSIDE, CALIF.
California Section A.W.W.A. Sec'y, H. C. Medbery, Water Department, 425 Mason St., San Francisco, Calif.

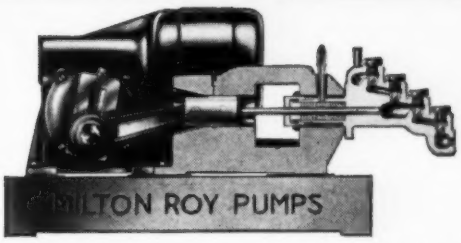
OCT. 28-29—LA CROSSE, WIS. (Hotel Stoddard)
Wisconsin Section A.W.W.A. Sec'y, L. A. Smith, City Hall, Madison, Wis.

NOV. 4-6—ATLANTIC CITY, N.J. (Madison Hotel)
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

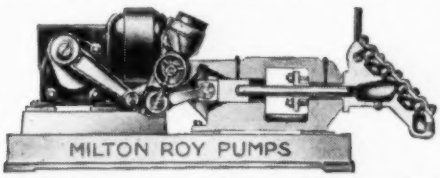
NOV. 8-10—ASHEVILLE, N.C. (Hotel George Vanderbilt)
North Carolina Section A.W.W.A. Sec'y, G. S. Moore, Supt. Water & Light, Albemarle, N.C.

NOV. 8-12—BOSTON, MASS. (Sessions-Mechanic Bldg.)
American Public Health Association. Sec'y, Dr. Reginald M. Atwater, 1790 Broadway, New York 9, N.Y.

NOV. 18-20—PANAMA CITY, FLA. (Hotel Dixie Sherman)
Florida Section A.W.W.A. Sec'y, S. K. Keller, Box 151, Clearwater, Fla.



Stroke Adjustment—Screw. Liquid End—Alloy.



Stroke Adjustment—Micro while running.
Liquid End—Cast Iron, cover plate design.

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Milton Roy Pumps are positive metering units for controlled volume pumping in which the length of the plunger stroke is quickly and easily adjusted to regulate the volume of liquid pumped. Precise control in pumping small volumes is thus made possible, down to as little as 1 pint per hour.

Milton Roy Pumps are now available with completely automatic electronic volume controls by means of which any changes in metered main-line flows will cause immediate proportional changes in the chemical flow delivered by the pumps. Many such installations are in successful operation, treating municipal and industrial water and waste.

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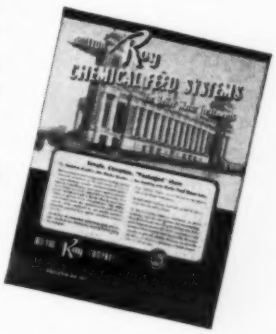

Ask for Catalog No. 146 and Technical Paper 54 "Electronics in Automatic Chemical Feed Systems".

MILTON Roy COMPANY
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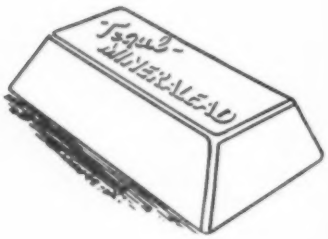

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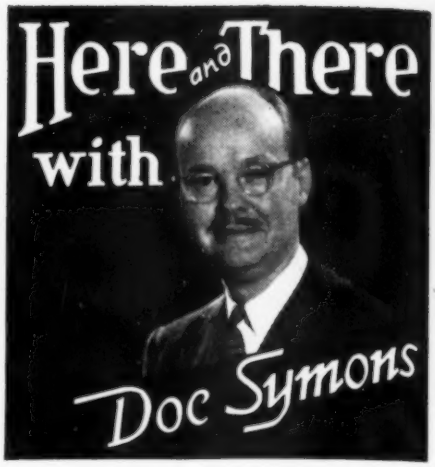
Manufacturers also of HYDE-RO Rings, the complete rubber packing to replace jute . . . and G-K, the original bituminous Sewer Joint Compound, proof against both acids and alkalis. Reduces or eliminates infiltration and pollution of ground waters.



H.T.M.A.—And this month, you just know that I'm going to tell you the story of the Atlantic City Convention of A.W.W.A. If you were one of the record crowd of 1705 attending, (one didn't register) you may recognize this story as paralleling your own; and if you weren't there, I hope this "letter" will give you a small idea of what went on.

Our story, and I say our, because Gin (that's my girl) and our boy Jimmy were with me—Jimmy is still on restricted activities following his rheumatic fever attack of last fall and his school agreed that a week in the warm sun in Atlantic City would do him good—Only there wasn't any sun on Mon., Wed., and Fri., and Tues. and Thurs. were cool, if not cold.

We drove down on Sunday afternoon, and inasmuch as our car holds five people, we were able to take Rollie and Nellie (Omega Machine) Leveque from Providence with us. It's not a particularly pretty drive and a forest brush fire at one place and heavy traffic (we were meeting fifty cars a minute) didn't add—but pleasant friends make a pleasant drive.

We arrived before 6 p.m. (it was raining) and strangely enough we pulled in at the hotel immediately behind our Bob *(W.&S.W.)* Wilson, and wife Doris, from our Chicago Office. Within the hour, we were unpacked and on our way to Hackney's with the Leveques and Lindy and Bennie (Pres. Omega Machine Co.) Harpers of Chicago. The three girls had not been together since the N.E. W.W.A. meeting in Poland Spring, Me. in Sept. 1946 and they had a lot to catch up on.

In between the conversational buzz we did see the famous lobster pool at Hackney's, indulged in lobster, steamed clams, Alaska giant crab, or scallops according to our individual fancies. "Lindy" read the souvenir program and informed us that Hack-

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PERMUTIT SPIRACTOR

The Spiractor cuts space requirements to a minimum by softening water 20 times faster than previous lime style treating systems. The Permutit Spiractor means maximum output in the minimum space.

In operation, hard water and the required lime enter at the base of the cone at a flow rate strong enough to suspend a catalyst bed of calcium carbonate granules without any carryover. The treated water is admitted tangentially to the cone to give it a swirling, upward motion. The precipitates that result from the water softening reaction are deposited on the catalyst granules by accretion. These enlarged catalyst granules are removed via a draw-off valve at the base. The effluent is soft water that has a low alkalinity content . . . water that's suitable for any required filtration.

Write for full information to The Permutit Company, Dept. W-6, 330 West 42nd St., New York 18, N. Y., or to the Permutit Company of Canada, Ltd., Montreal.

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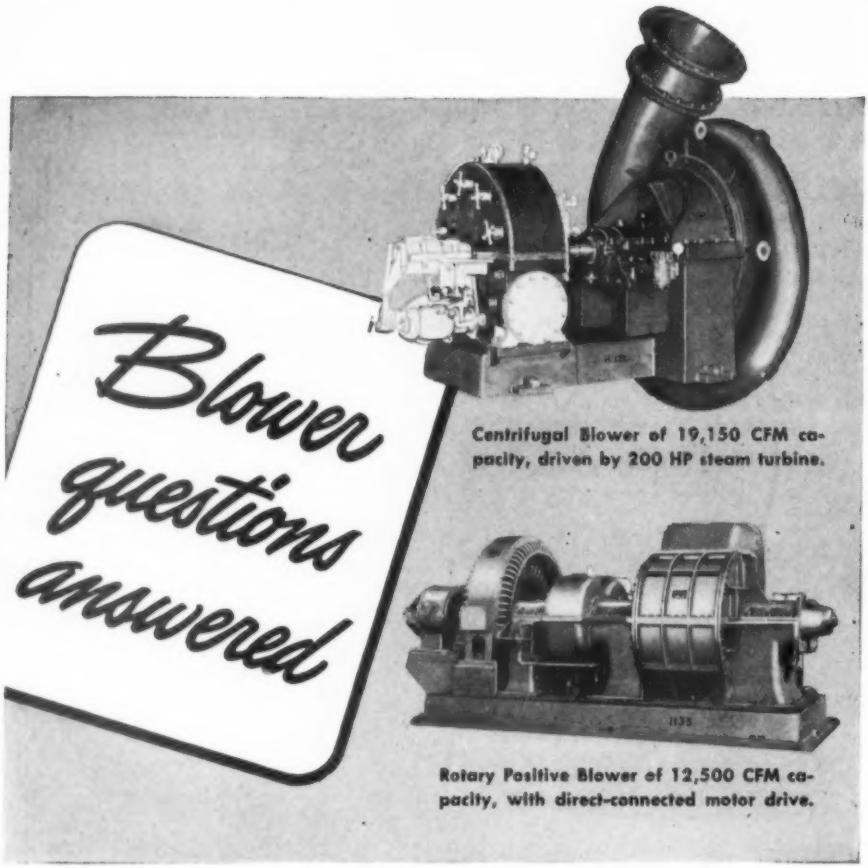
Blower questions answered
Centrifugal Blower of 19,150 CFM capacity, driven by 200 HP steam turbine.
Rotary Positive Blower of 12,500 CFM capacity, with direct-connected motor drive.

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When you put your blower questions up to Roots-Connersville, you gain these important advantages:

1. Long experience in the adaptation of blowers to needs of sewage plants and waterworks, coupled with the forward-thinking of our alert engineers.
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3. A wide range of standard capacities, from 5 CFM to 50,000 CFM (or higher), adapted to any modern drive, which makes for lower prices and faster deliveries than "special" designs.

Finally, when you have selected the R-C Blower that satisfies your requirements, you can be certain of sound, sturdy construction, low maintenance and operating costs, and a long life of profitable performance. For accurate answers to your blower questions, consult us.

In 1858, when the Atlantic Cable carried its first message, "Roots" had been building blowers for four years, since 1854. We're not good because we're old, but old because we're good.

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ONE OF THE DRESSER INDUSTRIES

ney's could feed 3000 at one sitting and how they do feed 800,000 persons a year, which according to Lindy's mathematical mind means that the restaurant operates at 80 per cent capacity every day—as if you cared.

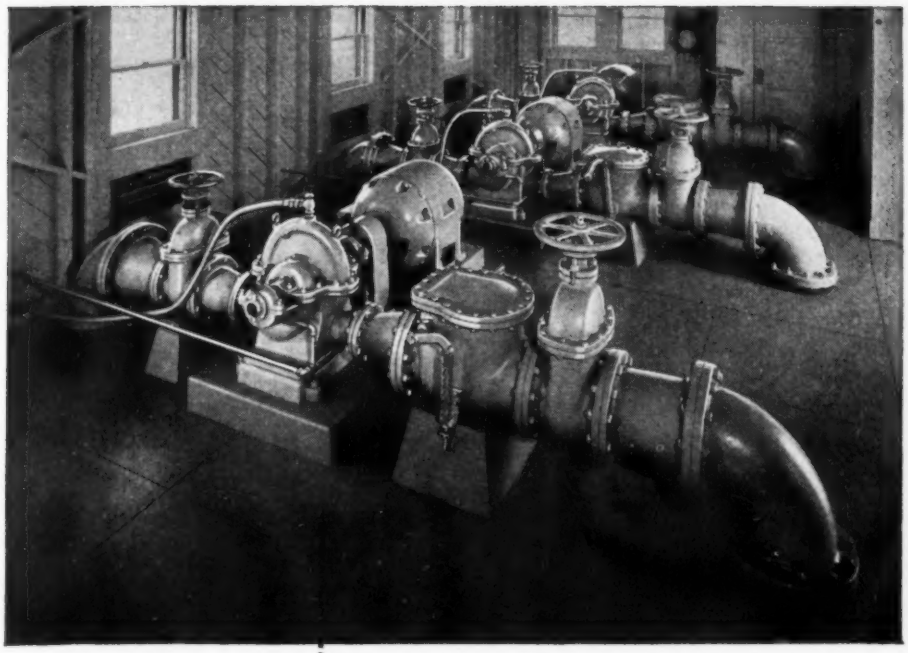
Well that was Sunday night, and there were other nights and other places to eat. Perhaps you tried Bishop's Savoy Bar and Restaurant for steaks, or the Knife and Fork or Capt. Storm's for seafood. Maybe you visited Jerry Trench's Neptune Inn for lobster or Doc's Sea Food House. If you wanted entertainment with your food, you probably went to Babette's, and of the hotels probably you found the best food at the Shelburne. If it was fried shrimp you craved, you should have gone to Stan Carson's Triangle, and of course if you wanted an unusual snack you surely stopped in for one of the famous Taylor Pork Roll sandwiches.

For the usual banquet fare, there was, of course, the annual banquet at the Hotel Chelsea, which apparently serves nothing but turkey. We were there on Thursday night for our turkey, but on the three previous nights, the White Shrine ladies had banquets at the Chelsea, and turkey was served each night.

If, by any chance, you drove down to Atlantic City, perhaps you stopped at MAC'S between Freehold and Lakewood. If you did you probably had one of those hamburgers which *Time* Magazine described as "the best hamburger between Newark and Cape May."

And while I'm on the subject of food, this year saw my second annual Tuna Fish Sandwish and Coke lunch with F. W. (Kit) Kittrell of T.V.A. This year the W & T Sanitary Twins, (A. E. Griffin and N. S. Chamberlin) joined us. We were all perched on stools in some small eatery near the Convention Hall, when in walked N. T. (Tom) Veatch for a hurried snack between sessions. Tom ordered a malted milk (Ulcers, Tom?) and the counter man said to him, "Are you attending the Water Works Convention". Knowing Tom's modesty, yours truly spoke up and said, "He's not only attending the convention, he's Mr. A.W.W.A., The Pres., himself." Whereupon the counter man handed Tom the check for our four lunches. (P. S. Griff got them back.)

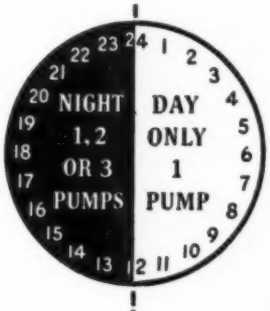
Speaking of Tom Veatch, it was Mike (Neptune Meter) Siebert of Richmond (and can Mike and his son pick good lookers for wives)—well, anyway, it was Mike who said that Tom Veatch is the "longest and shortest" A.W.W.A. president he can re-



IN SOUTH SAN FRANCISCO

Pumping costs are cut

BY DE LAVAL PUMPS WITH TIME CLOCK CONTROL



To assure the lowest possible operating costs, the California Water Service Co. has selected De Laval pumps for seventy-eight of its installations.

In the South San Francisco Station three of these pumps are operated by an automatic time clock system so designed that most of the pumping load is carried during the night at off peak power rates. A Bristol telemetering automatic control transmitter, located at the high level storage tank and connected over a leased telephone circuit, is tied in with a time clock control which operates one pump as required during the day; and one, two or three pumps at night.

The high sustained efficiency of De Laval Pumps keeps costs down year after year.

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WW-3

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member.—And if you translate that you'll find it's true. (Of course, when A. P. Black comes along he'll be longer but both of them will be shorter than Linn Enslow.)

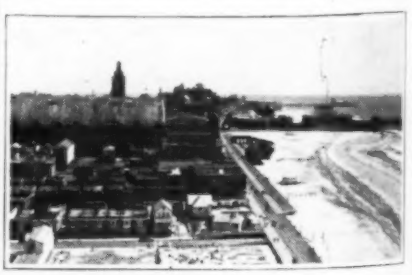
Well by now you know that it was a record convention with the 1704 plus one, but did you know that it was the superintendent of the water works I buy from (Westchester Joint W.W. No. 1) who broke the record. Yes sir, it was W. E. Thrasher (whose initials are all WET) who was number 1547 this year.

Yes, there were a lot of people there (I thought Sam Morris of Los Angeles wasn't going to make it, but he did). There were, however, quite a number I missed seeing, for instance—Mrs. Whyte (that's Mrs. Tom Henry's 82 year old mother and one of my readers) and Mr. and Mrs. Harvey Jones, all of Toledo; "Marty" (Mrs. Hal) Hutton of the W & T Huttons; the Jacques Benoits of Montreal, Mrs. Bert (A. E.) Berry of Toronto, and all the other members of the Ancient and Honorable Order of Sewer Rats of Ontario and their wives; Mary (Mrs. Jake) Van Atta of Hackensack; the Buswells of Urbana, Ill.; Jo and Mary Quinn of Terre Haute, Ind.; "Bill" O'Connell of Los Angeles, the Beiswangers of Billings, Montana—and—Why say—if just all the nice people I know who *weren't* at Atlantic City were to come to the Chicago Convention next year, it would be another record breaker.

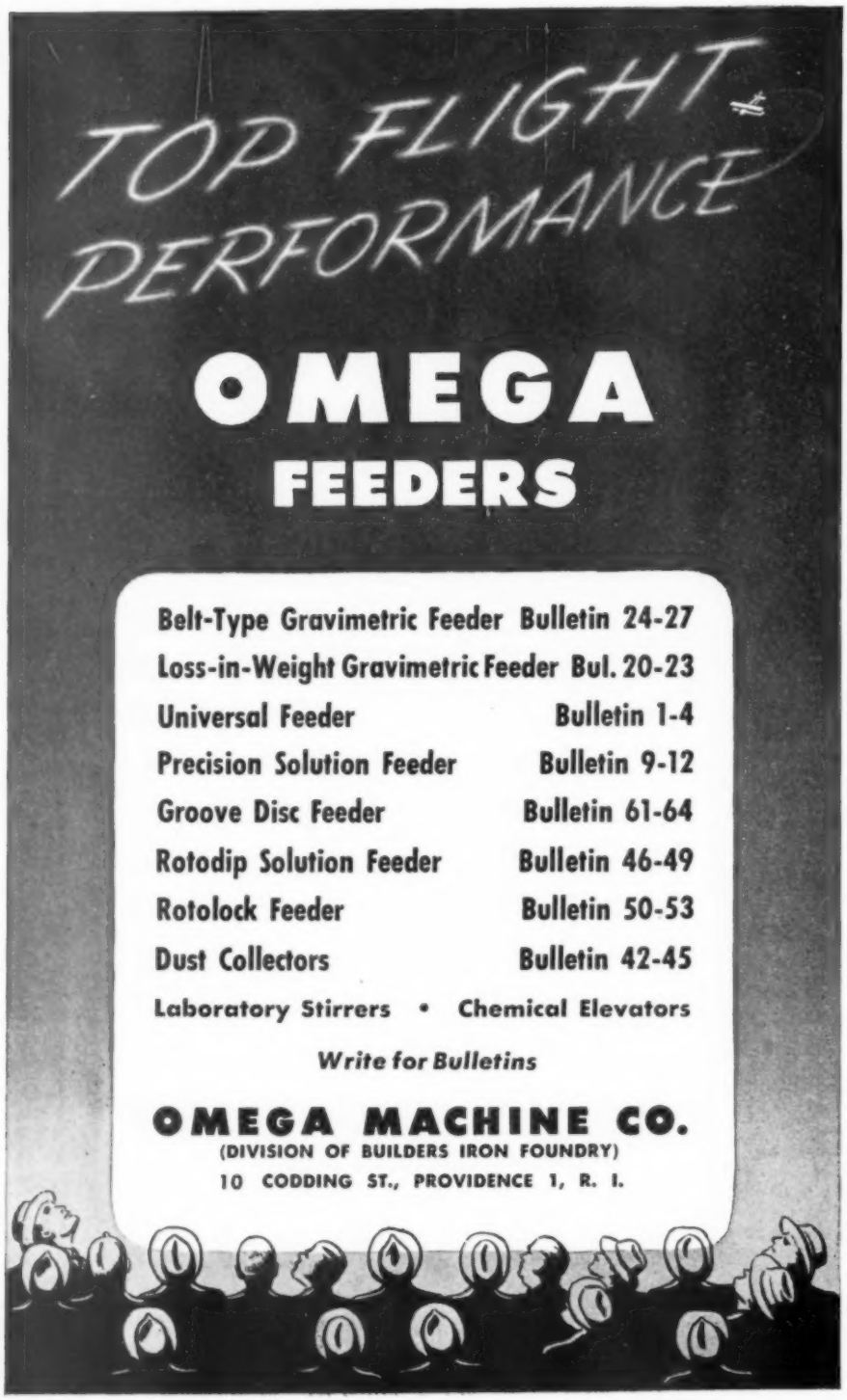
Registration this year was simple and well handled, thanks to Eric Johnson and Dan Fischel of the A.W.W.A. (I wonder if those two ever read what I wrote about them in a column a few months back.) The "Hosting" of the N.J. Section boys helped too; and of course the ubiquitous Art Clark of the W.S.W.M.A. and his convention hat (which he has worn but five weeks in four years) kept the exhibitors happy. The exhibits this year were instructive, interesting, and inspirational. No doubt,

the most popular exhibit was the *Water & Sewage Works* Annual Reference and Data issue, with the beautiful front cover—and—the new *Water and Sewage Works Notebook*.—If you didn't get one of those notebooks, look for them at the various sectional meetings. One of the gags of the convention exhibit hall was to ask people if they had met Al Brumley's brother, Alhydro—and the Westinghouse "Ooophmeter" which found most persons in need of Oysters (Seaver Jones, of Centriline Corp. was "Fully Charged")

Not all of the convention was serious, as witness the above photograph of George Moore, Chairman of the No. Carolina Section. I took a few other shots, some of



which I'll try to get in the next issue. Meanwhile, just take a look at this and see the Boardwalk up and down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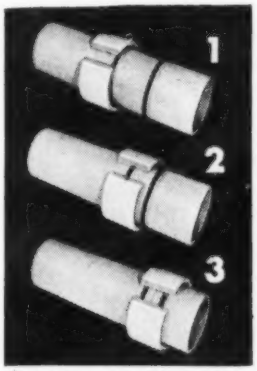
Engineering Facts about

Johns-Manville TRANSITE PRESSURE PIPE

The Simplex Coupling

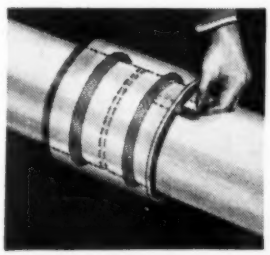
THE SIMPLEX COUPLING—the standard coupling for Transite* Pressure Pipe—was engineered by Johns-Manville to minimize costly underground leakage and to provide maximum protection against pipe line failures resulting from trouble at the joints.



SIMPLICITY of the Simplex Coupling helps assure perfect joints independent of workmen's skill. These cutaway views show complete assembly operation: (1) Start, (2) Sleeve pulled over one ring, and (3) Final position with sleeve centered over joint.

It consists of only three parts: a Transite sleeve, carefully machined to fit over the end of the pipe, and two rubber rings which, when assembled, are tightly compressed between pipe and sleeve. The result is a tight yet flexible seal that provides a number of important advantages.

First, its effectiveness does not depend on the individual skill of the workmen. The Simplex Coupling is, in effect, a factory-made joint which is simply *assembled* on the job. Perfect joints are quickly, easily made, even by inexperienced crews. And—a unique feature—each joint may be checked for proper assembly immediately upon completion.

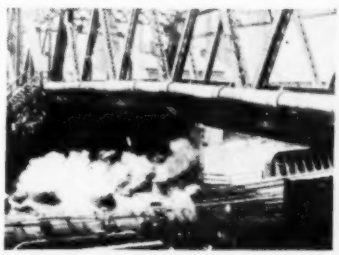


PROPER ASSEMBLY of each joint is readily checked by inserting a feeler gauge between sleeve and pipe. If position of the rubber rings is correct, the joint is properly made.

Moreover, the flexibility inherent in the design of this coupling safeguards against leakage once the pipe has been placed in service. Because each joint is capable of deflection, the entire line has a flexibility not commonly found in other types of underground water line construction. This minimizes flexural stresses in the line . . . enables the pipe to conform to soil movement . . . helps it absorb the vibration of heavy traffic under busy city streets. Many thousands of miles of Transite Pipe confirm the ability of the Simplex Coupling to protect the line against the stresses that so often cause joint leakage and frequently result in pipe failure.

DEFLECTIONS up to 5° at each joint are possible with the Simplex Coupling. This permits laying the pipe around curves or obstructions as shown by the installation above.

Joints that stay tight in service are but one of many important advantages of Transite—the modern asbestos-cement pipe that was engineered to carry water more efficiently and more economically. For further engineering facts, write for Brochure TR-11A. Address Johns-Manville, Box 290, New York 16, N.Y.



The flexibility inherent in the Simplex Coupling helps guard against the shock and vibration of traffic. Under busy city streets, this factor also minimizes flexural stresses.

*Transite is a registered Johns-Manville Trade Mark

JOHNS-MANVILLE JM PRODUCTS

which we walked from the hotel to the Auditorium and back. On one of those trips when Jupiter Pluvius was making one of his more determined visits, I noticed a sign in one of the shop windows along the walk; it read, "Welcome to the American Water Works Association." Dripping as I was, I thought to myself, "It looks as though the Water was Giving us the Works." Hmmmm—Well it sounded funny at the time.

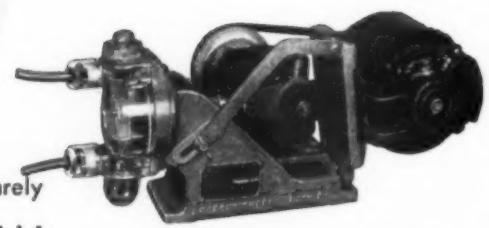
To get back for a moment to Sunday night; that was the night that Bernal Swab (of Jones and Henry, Toledo, O.) showed his pictures, motion, that is, of the San Francisco Convention of last year and the trip thereafter. Several persons who saw themselves on the screen (and they were mighty well done movies, too) wondered how the mountain goats got in there—they were real mountain goats. Bernal paid me a very nice compliment, too. When my picture showed up, Bernal, who was giving a commentary over the loud speaker, said, "And there's someone every one knows." Oh come now, Bernal,—I just wish I were that well known.

On Monday night, the water works families were pushing the walls out of a huge room in the Ambassador Hotel to see the Family Night Show, which "Bill" Orchard put on with the help of Grace, (Mrs. Fred) Stuart of Baltimore. Bill played his "accordeen" and did a piano duet with Grace and generally emceed the acts which included some mighty nice singing by a dozen or so of the boys (with Jane Orchard); Lloyd Nelson and "Bill" Henderson did magic tricks, Allan Johnstone was far more than amusing as General Pierre, a French expert on dehydrated water and inverse sedimentation (from down to up); Tom Veatch received a present from the New Jersey Section, something his home should never be without, and a beautiful jade ring from the Rocky Mt. Section. Wendell La Due, from Akron, Ohio, reminded the audience that a "buckeye is a round smooth nut with no nutritious value." But the act that really laid them in the aisles was George (W&T) Hagetter who romped through "Easter Bonnet,"—and darn it—Jimmy ran out of flash bulbs before George went on.

This year the theme song of the convention as presented at the Family night party was that beautiful, nostalgic Maori farewell song, "Now Is the Hour", one of those haunting melodies, that always reminds you of someone, some time, or some place. And with that rather sentimental note, I shall close for this time and carry on this story when next we meet in the July issue.—V.T.Y., Doc.

...AND IN EVERY COMMUNITY

A PURE WATER SUPPLY!



CAMPAIGN promises are rarely kept, but election year . . . and every year . . . you can count on pure, safe water if you choose a %Proportioneers% Heavy Duty Midget Chlor-O-Feeder to hypochlorinate your water supply. This small proportioning pump treats from a few gallons up to a million gallons of water a day, and is easily adjusted to feed any chemical at rates up to 7½ g.p.h., against pressures to 85 p.s.i. When cross-connected to the starting switch of the water pump motor, it provides fully automatic treating in exact proportion to flow. Because of its extremely simple, rugged construction, the Heavy Duty Midget does not require a skilled operator. In thousands of communities where it has been chosen for the important job of making drinking water healthy this "little red pump" has an outstanding record of performance.

Now available from stock — see your local representative or write today for Bulletin HDM-2.

% PROPORTIONEERS, INC. %

9N CODDING ST., PROVIDENCE 1, R. I.

"di-ATOMIC"

"Back to work everybody. Miss LaVere is just going to look up the spelling of DIATOMACEOUS."

ARCHITECTURAL CONCRETE
for Economy in Sewage Treatment Plants

Pollution of streams and lakes by sewage and industrial waste endangers health, reduces property values and impairs recreational facilities. Progressive communities can conquer this menace of pollution with sewage treatment plants.

Architectural concrete is the ideal construction material for the service buildings in these plants because its cleanliness is a symbol of sanitation. It can be molded into distinctive buildings that are a community asset. They'll be firesafe, too, because concrete can't burn.

Architectural concrete buildings are economical because (1) both structural and ornamental parts are cast in one operation, (2) they have long life, (3) maintenance is low. Taxpayers like such ***low-annual-cost*** construction because it serves and saves for many years.

Write for free illustrated literature: "*Sewage Treatment Works,*" a 24-page booklet describing sewage treatment methods, the need for such plants and how they can be financed; also "*S-101,*" a folder picturing representative sewage and waterworks plants. This literature is distributed only in the United States and Canada.

●

Photo shows architectural concrete service building at Virginia Beach, Va. Wiley & Wilson, consulting engineers.

PORTLAND CEMENT ASSOCIATION

DEPT. 6-29 • 33 W. GRAND AVENUE • CHICAGO 10, ILLINOIS

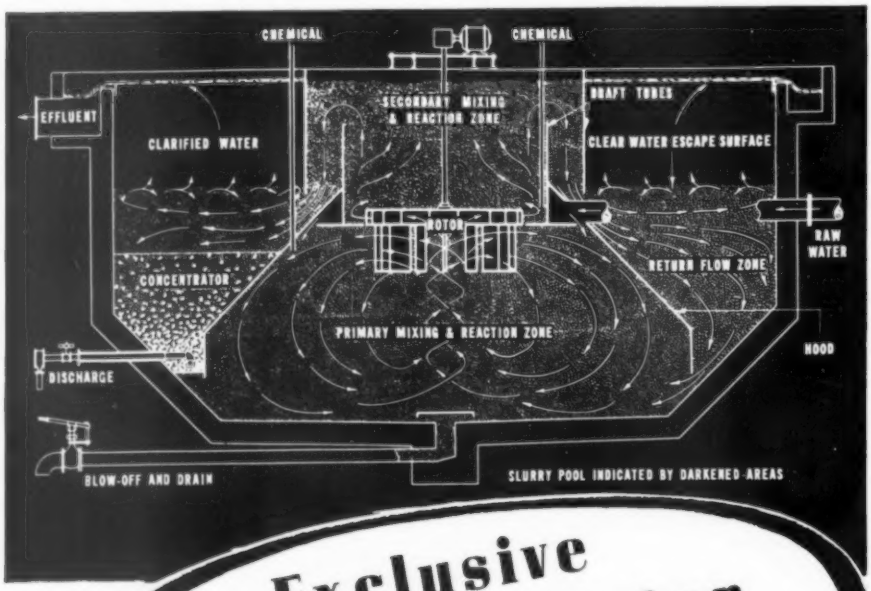
A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

Wisconsin Eighth Water Works Course

The University of Wisconsin held its eighth annual Water Works Short Course on April 19 to 22. The course was attended by 83 water works operators from more than 75 communities in the state.

Among the topics presented at this three-day school were laboratory control, water sterilization, chlorination practice, back flow and cross-connections, meter shop methods, care of pumps, motors, etc., ground water, records, distribution, trenching safety, public relations, coagulation and softening, water rates, and so forth.

The course was conducted by the staffs of the laboratory of Hydraulic and Sanitary Engineering, the State Laboratory of Hygiene, and the State Board of Health. The course was sponsored by the League of Wisconsin Municipalities and the Wisconsin Section of the A.W.W.A.



Exclusive Rotor Circulator with the ACCELATOR

The rotor circulator makes possible the exclusive operating principle of the ACCELATOR* which effects a "dynamic separation" of treated water from a directed flow of slurry. It has two parts on one shaft connected directly to a speed reducer.

The lower part thoroughly mixes the incoming raw water and treating chemicals with the highly concentrated slurry in the primary mixing zone. It turns over the contents every minute and prevents settling, although the rotor is several feet above the bottom.

The upper part produces the exclusive slurry circulation with the positive return of solids from the separation zone to the primary mixing zone which is found only in the ACCELATOR.

All motions in the ACCELATOR are independent of the treating rate. The mixing and positive recirculation are the same with high or low throughput. The surface of the slurry pool remains substantially at a constant level.

Ask for information on other exclusive features of the ACCELATOR. INFILCO Inc., 325 West 25th Place, Chicago, Illinois.

* Trade-Mark Reg. U. S. Pat. Off.

IF YOU WANT TO KNOW — ASK INFILCO

N.Y. State Drafts Model Sanitation Code

The Joint Legislative Committee on Interstate Cooperation, headed by Assemblyman Harold C. Ostertag of Attica, N.Y., has drafted a model sanitation code, designed to aid communities in correcting local sewage disposal and water pollution problems.

The code is a suggested measure to deal with the problem which Mr. Ostertag believes is a function of local government. It is hoped that by the voluntary adoption of this code by communities they will join in a concerted state-wide attack on this health and welfare matter.

The model code is a part of a state-wide program of stream conservation and pollution abatement on which the special committee on pollution abatement has been at work for more than two years. One part of the program provides for state aid to the localities for the planning of sewage treatment plants. Under the legislation, the state will match funds put up by localities for sewage treatment plants to an amount not exceeding two per cent of the construction costs of such plants.

The main phase of the program is the development of a state pollution control board with authority to conserve the state's waterways through elimination of pollution. A bill embodying this proposal will be presented to the 1949 legislative session for enactment.

Michigan to Have Special Training Course

Michigan State College has planned its second five-week special training course for sewage and water works operators, to be held under the direction of the School of Engineering and Department of Bacteriology. This course, which was started last year replaced the two-day course formerly given for sewage plant personnel in conjunction with the annual conference of sewage works associations, and the three-day course customarily held for water plant personnel.

The subject material offered in the course has been so divided as to provide five separate but related courses, each lasting from Monday morning through Friday afternoon during five consecutive weeks. Anyone may en-

DIXIE TANK AND BRIDGE CO.

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Complete Service for Elevated Water Tanks—

30 Years Experience

BE SAFE DON'T GAMBLE!

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress.

On completely re-conditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

COPYRIGHT, 1947

THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

roll for any or all of the five weekly courses. Plans are made to repeat the school at frequent intervals, probably yearly, in order to give everyone an opportunity to complete the entire course at his convenience. Thus a man may take every one of the five weeks over a period of five years.

The first week's work opens June 14th and the final week's work closes July 16th. During the first week the fundamentals of mathematics and chemistry are presented. The second week will be devoted to fundamentals of water and sewage flow and the factors affecting this flow (hydraulics). The third week will present bacteriological tests on water and sewage. The fourth week is devoted to laboratory tests commonly used in the control of sewage treatment processes. The last week covers a study of methods of operation and maintenance of sewage disposal and water supply facilities.

The Michigan Department of Health, the Joint Educational Committee of the Sewage Works Association, and the Michigan Section of A.W.W.A. give their support and assistance to the conduct of this program. The work will be offered under the following professors: E. F. Eldridge, in Chemistry, Frank R. Theroux in Hydraulics, and Dr. W. L. Mallman in Bacteriology.

Buffalo Meter Company has perfected an interchangeability of parts that is unsurpassed. Not just an interchange of expensive unit assemblies, but *actual interchangeability of parts, piece for piece.*

This full interchangeability of parts in Niagara and American Meters is made possible by their simplicity of construction. Other advantages of Buffalo Meter's simplified construction are *ease of repair* and *reduction in stocks of parts* needed for repair.

Buffalo Meter interchangeability of parts is illustrated by the two halves of the measuring chamber, which are available separately; do not have to be factory matched pairs.

Buffalo Meter Company manufactures The *American* Meter (bronze casing) for soft water, and the *Niagara* (galvanized-iron casing) for most hard water requirements. Send for literature.

AMERICAN BRONZE CASE
NIAGARA GALV. IRON CASE
WATER METERS
BUFFALO METER COMPANY
2909 MAIN STREET • BUFFALO 14, NEW YORK
Simplicity

MANUFACTURERS' and EQUIPMENT NEWS

600

Power Sewer Cleaner

Flexible Sewer-Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif., has improved their power bucket machine for sewer cleaning.

This new model power bucket machine contains at least ten major mechanical features to speed power cleaning operations to increase work safety in sewer cleaning.

Shown in the accompanying photograph, this new unit has a 7.7 hp. gasoline engine, with a reserve pull of over 8000 lb., and cast steel cable swivel which permits rotation under pulls up to 10,000 lb. These are but a few of the many new features of this item.

For further information about this Flexible Sewer Power Cleaner, enter the above key number on a Reader Service Card and mail.

Roots-Connersville Opens Cleveland Office

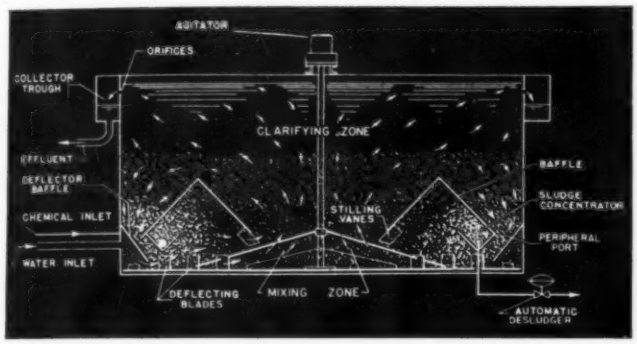
Roots-Connersville Blower Corp., Connersville, Ind., has opened an office in Cleveland, Ohio, at 2306 East 22nd St., in the Plymouth Building.

(Cont. on p. 90A)

IRON AND MANGANESE REMOVAL

An "Iffy" Job that Requires Experienced Specialists

If iron is present without manganese
If manganese is present as well as iron
If impurities are in ferrous and manganous form
If iron is present in organic combination
If hardness also is to be removed
If water is high in alkalinity
If water is high in CO_2
If air enters the system
If pH value is low



Staining of porcelain basins, dishes and linens . . . color and bad taste of water . . . demand the elimination of iron and manganese when these troublesome impurities are present in water supply.

The LIQUON engineers can apply more than 30 years of specialized experience to your particular problem. In addition, they can also supply exactly the right equipment and materials, because LIQUON service includes every process and every type of equipment for any water conditioning requirement.

A preliminary investigation and recommendations by LIQUON will not involve the slightest obligation on your part. Therefore, if your water supply contains iron or manganese . . . or any other impurity . . . consult the LIQUON engineers without delay.

LIQUID CONDITIONING CORPORATION

114 East Price Street, Linden, N. J.
Engineering Service Representatives in Principal Cities

Send The Coupon

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114 East Price St., Linden, N. J.

Please send me reprints of papers checked:

☐ Iron and Manganese Removal
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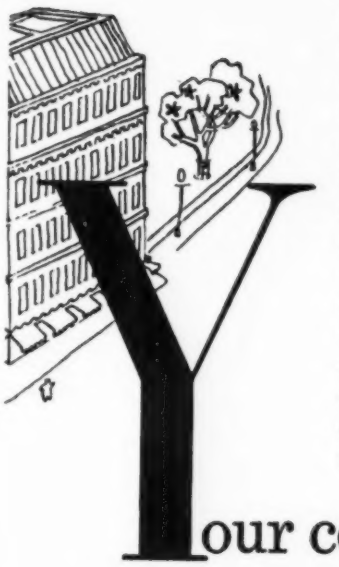


Altitude Control Valves by Golden-Anderson faithfully maintain a 3" to 12" water level variation, and are designed to assure unfailing water control under all climatic conditions. A special needle valve adjustment permits proper valve speed to suit any operating requirements, while inherent water cushioning design minimizes surge and water hammer problems. These valves may be arranged with auxiliary equipment to perform a variety of water control services. Write for complete information today.

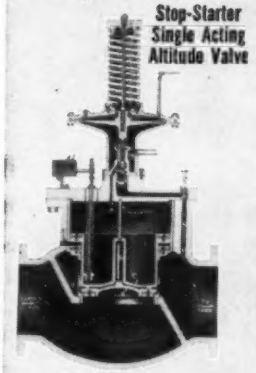
Your community...

needs the safety and lasting dependability of

GOLDEN-ANDERSON

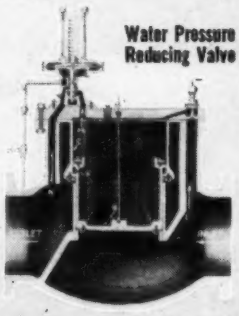
POSITIVE CONTROL

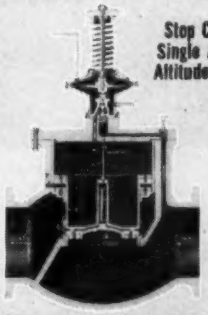
Valves



GOLDEN-ANDERSON VALVE Specialty Co.

Keenan Building • Pittsburgh 22, Pa.





This office will be under the management of Franklin F. Bogardus, district sales manager, and the area covered will be about the same territory as that previously handled from the factory.

601

Non-clog Sewage Pump

Economy Pumps, Inc., Hamilton, Ohio, has announced a redesigned and improved small non-clog sewage pump. The pump is primarily adapted to the pumping of miscellaneous pulps, sewage, or trash. Many new advantages are designed into the pump.

For further information on this new unit, enter the above key number on a Reader Service Card and mail.

Frank Roe Returns to Carborundum

Frank C. Roe, who has been eastern sales manager for the Chicago Pump Co. during the past two years, returned to the Carborundum Company June 15 as development engineer in the Refractories Division.

Mr. Roe, who was formerly a sales engineer with the Carborundum Co., from 1932 to 1946, will work on development problems in all of the process industries and problems

throughout the entire country. The division naturally includes the water and sewage works.

Mr. Roe graduated from the Univ. of Illinois in 1925, was employed by the Sanitary Dist. of Chicago for a number of years, and did consulting work in Chicago for five years before becoming associated with Carborundum in 1932. He is well known throughout the field of water and sewage works for his work on porous diffusers and a number of his articles have appeared in *Water & Sewage Works*.

In his new position Mr. Roe will be located in Perth Amboy, N.J.

602

Portable Gate Valve Operator

Payne Dean & Co. of Madison, Conn. has designed and developed a new portable gate valve operator called the Powerwrench. Shown in

the accompanying photograph, this gate operator, powered by a portable gasoline engine, can be used to operate gate valves at practically inaccessible locations.

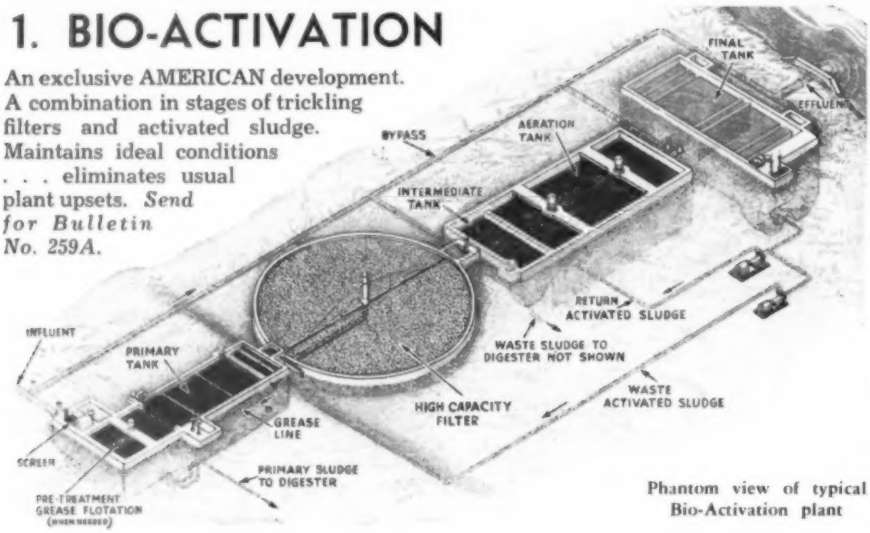
A revolution counter is an integral part of the unit, making it a positive means of knowing the extent to which the valve is opened or closed.

Further information on this unique unit may be obtained by entering the above key number on a Reader Service Card.

TWO GREAT DEVELOPMENTS
for the Activated Sludge Process

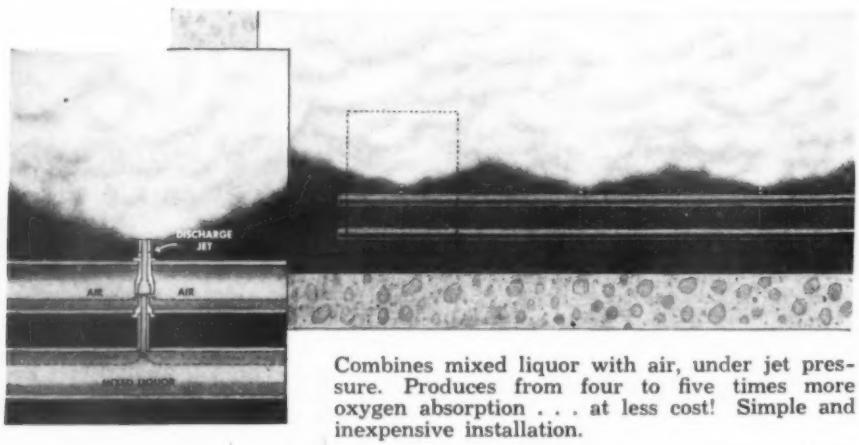
1. BIO-ACTIVATION

An exclusive AMERICAN development. A combination in stages of trickling filters and activated sludge. Maintains ideal conditions . . . eliminates usual plant upsets. ***Send for Bulletin No. 259A.***



Phantom view of typical Bio-Activation plant

2. JET AERATION*



Enlarged cross-section shows principle of operation.

Combines mixed liquor with air, under jet pressure. Produces from four to five times more oxygen absorption . . . at less cost! Simple and inexpensive installation.

Write for Bulletin 265 and data on plants now operating.

**Licensed by The Dow Chemical Co.*

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108 North Broadway
AURORA, ILLINOIS

Pumping, Sewage Treatment, and Water Purification Equipment
RESEARCH · ENGINEERING · MANUFACTURING

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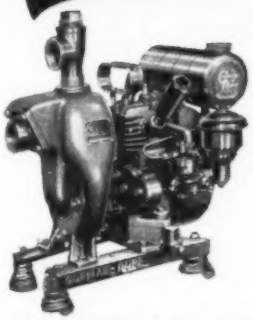
COMPARE O. S. C. SEPTIC TANK CLEANING



GORMAN-RUPP'S NEW "MIDGET" 1½" PUMP

FASTEST, self-priming, most efficient pump for general use. Weighs but 62 lbs. -- pumps 5500 GPH -- self-primes up to 30 ft. -- non-clogging, sturdy. Gorman-Rupp builds a complete line of pumps from the "HANDY", delivering 8 GPM, to large capacity pumps which deliver as high as 125,000 GPH.

WITH OLD FASHIONED, UNSANITARY METHODS

When a Sanitary Service Operator puts a new Gorman-Rupp Odorless Sanitary Cleaner on the job these are the results:—

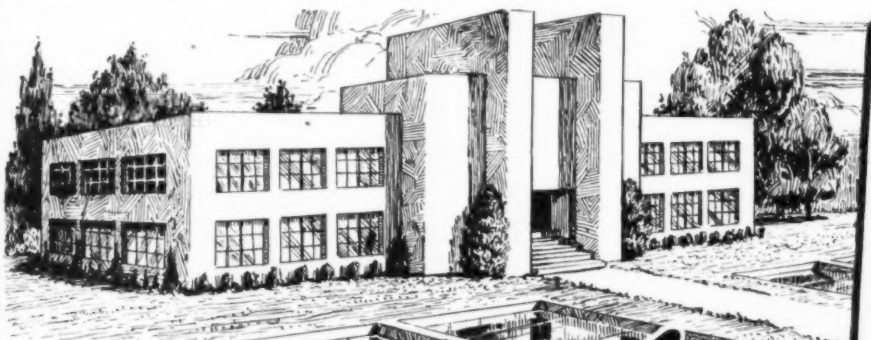
1. A disagreeable job becomes pleasant, easy work.
2. Unsanitary methods and unhealthy conditions eliminated. Septic tank cleaning with an O. S. C. unit complies with or exceeds health regulations and requirements. It banishes open tanks, diaphragm hand pumps, shovels and other makeshift equipment.
3. It does each job more thoroughly, in a fraction of the time previously required. For example, 500 gal. tanks are cleaned in 15 minutes, 1000 gal. tanks in 20 minutes.
4. It offers operators profit possibilities far in excess of income with present equipment and methods.
5. An O. S. C. unit has other profitable uses such as transporting water, emergency fire fighting, sprinkling, dewatering, etc.

Show this to Sanitary Service Operators in your community. For complete information write for Bulletin 7-ST-11.

THE GORMAN-RUPP COMPANY

327 NORTH BOWMAN STREET

MANSFIELD, OHIO



Write for New Booklet

This book contains information, charts, diagrams, etc., as well as general information on the advantages to be obtained with FERRI-FLOC.

TENNESSEE CORPORATION
Grant Building Atlanta, Ga.

LOOK AT THESE *Advantages...*

TENNESSEE CORPORATION Ferri-Floc FERRIC SULPHATE

As Summarized By a Prominent Professor of Chemistry and Water Consultant of a Large University

Coagulation is effective over a much wider pH range than with other coagulants. Color flocs may be formed in the very acid range. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10, or even higher, for the removal of turbidity and manganese.

The time required for floc formation, conditioning, and settling is in most cases considerably shorter than that required for other coagulants.

Filter runs have been markedly increased in most cases.

Manganese is successfully removed at pH values above 9.

Effluents may be produced which are exceedingly low in both iron and aluminum.

Ferric floc does not seem to stick to sand grains to form mud balls, and is subject to less "breaking through" on the filters.

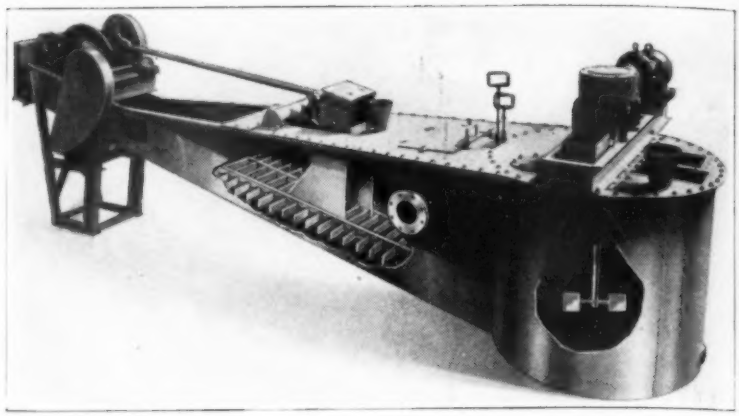
TENNESSEE CORPORATION
Atlanta, Georgia — TENNESSEE CORPORATION — Lockland, Ohio

603

New Lime Slaker

The Dorr Co., 570 Lexington Ave., New York 22, N.Y., has developed the Dorrco Slaker for slaking lime. This slaker consists of two component sections, one for slaking the lime, and the other for classifying, washing, and removing the grit.

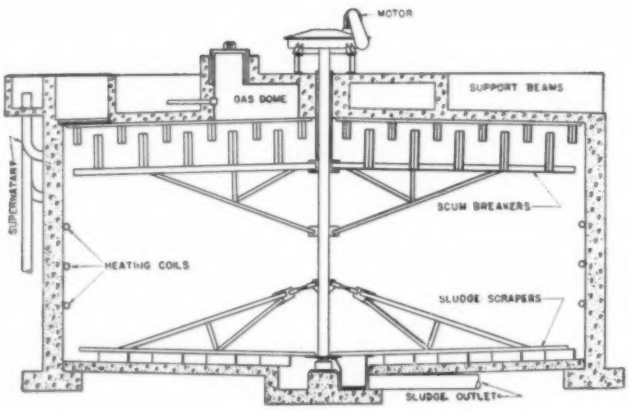
In operation, the slaker is simple and continuous. Lime and a portion of water or liquor are fed into the slaking compartment through suitable openings; the balance of the water or liquor is fed into the classification compartment, and its proportioning between the two compartments can be adjusted, within limits, to suit particular requirements of the job. After slaking, the slurry passes continuously through the submerged ports to the classification section, in which material coarser than 65 mesh will settle out. The grit is raked up an incline and discharged.



The advantages claimed for this new unit are high efficiency, low installation costs, compact installation, low maintenance, extra corrosion protection, and operating simplicity.

For further information on this new unit, enter the above key number on a Reader Service Card and mail.

HARDINGE DIGESTER MECHANISM



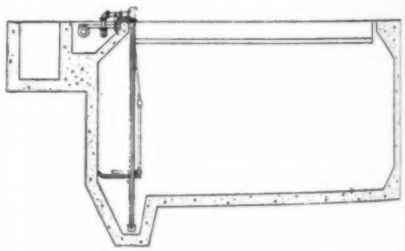
The Hardinge Digester Mechanism is used in sewage sludge digestion tanks to aid in their operation. It consists of sludge scrapers operating at the tank bottom and rigidly attached to a central torque tube, rotating scum breaker arms, and a gas dome in the tank top to collect and remove liberated gases. It prevents scum accumulation and insures uniform gas production. Permits the use of a nearly flat-bottom tank and emits a dense digested sludge.

HARDINGE
COMPANY INCORPORATED
YORK, PENNSYLVANIA — 240 Arch St. • Main Office and Works
NEW YORK 17—122 E. 42nd St. • 205 W. Wacker Drive—CHICAGO 6
SAN FRANCISCO 11—24 California St. • 200 Bay St.—TORONTO 1

604

Hydraulic Grit Removal

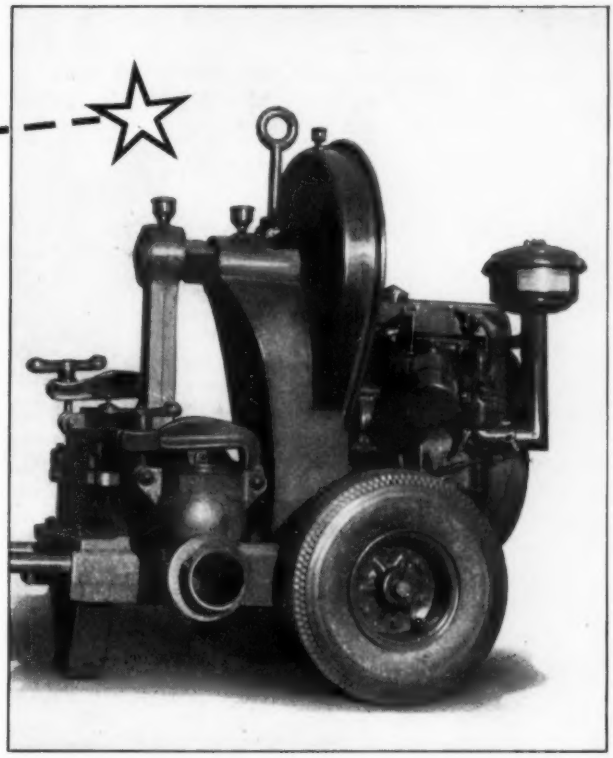
Chicago Pump Co., 2300 Wolfram St., Chicago 18, Ill., has developed a new grit removal system for separating washed grit from sewage. This new system is designed to settle grit in a tank built with the general cross-section of a standard diffused air type aeration tank with hoppers provided to collect the grit and with removal accomplished through the use of a water jet.



Air is introduced into the diffusers to produce a roll of the tank's content and maintain lighter particles in suspension allowing the heavier sand to collect in the hopper from which it is removed by the water jet.

This method of grit removal has advantages of requiring very low maintenance and of producing a clean organic-free grit. It may also be

CARTER HUMDINGER DIAPHRAGM PUMPS



New and redesigned to give even more efficient service, the CARTER "Humdinger" diaphragm pump has been engineered to handle the toughest of dewatering problems. This new, relatively simple design embodies fewer wearable parts, which means less "time out" on the job.

With less "time out" the contractor is assured of greater savings and economy of operation, together with the reliability of a proven product.

Pumping reliability is a must in the contracting field—choose a "Humdinger" and you're guaranteed a unit that will pump any flowable substance!

● Write for Bulletin 4503

★ OTHER EQUIPMENT •
MIXING • FLOCCULATION • DIGESTERS •
ALTERNATING SIPHONS • CLARIFIERS •
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DIAPHRAGM PUMPS • PNEUMATIC EJECTORS

RALPH B. CARTER COMPANY
HACKENSACK, NEW JERSEY

FLOATROL

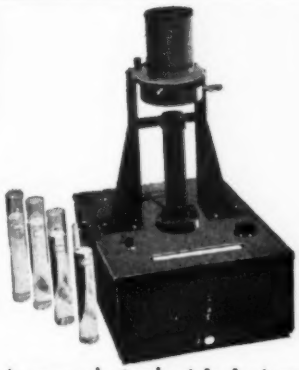
For OPEN TANKS and SUMPS
Controls 1 to 3
SEQUENCE OPERATIONS
From ONE Float

Floatrol gives you automatic control of sequence operation of 1 to 3 circuits for pumps, valves or alarms, corresponding accurately to changes in liquid level in open tanks or sumps. Can be mounted on wall bracket, ceiling or pedestal as shown. Available with Depth Indicator and Manual Transfer Plugs or Automatic Alternator.

Ask for Bulletin F-6

For control of more than three circuits, ask for Bulletin S-7 on SELECTROL.

AUTOMATIC CONTROL Company
1013 University Ave., St. Paul 4, Minn.



LUMETRON
Photoelectric Colorimeter Model 450 for Nessler Tubes

A new photoelectric instrument of high accuracy for the measurement of color and turbidity, as well as for all analytical colorimetric tests in the examination of water and sewage.

- Turbidity tests in terms of APHA (ppm) scale.
- Color tests in terms of APHA (mg Pt) scale.
- Suited for determination of ammonia nitrogen, nitrate, nitrite, and for all other colorimetric tests according to APHA "Standard Methods."
- Operates with all "low form" Nessler tubes 32 mm O.D., 200 mm high. Requires no matched sets or tubes.

LUMETRON Mod. 450 eliminates the uncertainties of visual matching methods. It requires no permanent color standards and furnishes reproducible results independent of individual judgment and of light conditions.

Write for literature to

PHOTOVOLT CORP.
95 Madison Ave. New York 16, N. Y.

Write also for literature on

PHOTOVOLT Line-Operated pH METER

placed ahead of the screening grinders which has added advantages.

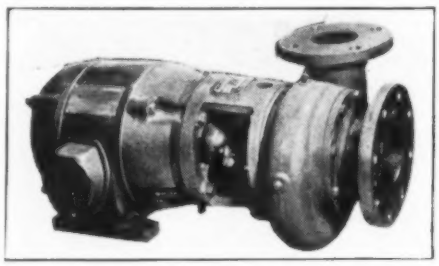
For further information on this aerated grit chamber system, enter the above key number on a Reader Service Card.

605

Byron Jackson Bilt-On Pump Line

The Pump Division of the Byron Jackson Co., Los Angeles, recently announced a new merchandising plan for their line of Bilt-on Pumps. These pumps are general service compact pump-motor units for all types of industrial plants.

With 8 cases, 8 motors, 9 impellers, and a stock of small parts, it is now



possible to assemble a Bilt-on Pump that will handle capacities from 10 gpm. to 600 gpm. at heads up to 340 ft. There are 322 pump combinations available with the plan.

If you desire further information on these pumps, fill in a Reader Service Card with the above key number.

Names Make News at Mathieson

Mathieson Chemical Corp., formerly known as the Mathieson Alkali Works, has announced several changes in personnel in various departments.

Dr. D. P. Morgan joined the corporation as administrator of research and development and will be in charge of market research as well as chemical research. For the past two years he has been with W. R. Grace & Co. in charge of chemical market research and development.

D. P. Morgan — V. Woodside
R. F. Boehm — J. D. Schofield, III

New appointments to the sales engineering staff include John D. Schofield, III, as heavy chemical sales representative in the central New Jersey, southern New York, western Connecticut, and northeastern Pennsylvania areas. Mr. Schofield will handle chlorine, ammonia, sanitation, and water treatment chemicals.

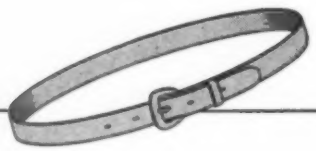
A new southern sales area, and new district sales managers at New Orleans and Houston have also been announced. Vernon Woodside will be in charge of the New Orleans sales district and Roland F. Boehm will be in charge of the Houston sales district.

606

Stops Sweating

J. W. Mortell Co., Kankakee, Ill., has an industrial NoDrip plastic cork coating which is designed to stop condensation, dripping from sweating tanks, pipes, walls, ceilings, air ducts,

Adjustable
TO THE WAISTLINE



Adjustable
TO THE
PIPE LINE

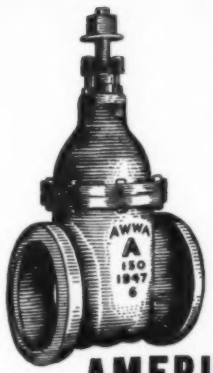
The Dresser Style 60 Bell-Joint Clamp is adjustable to variations in bell-and-spigot dimensions—makes installation easy and seal completely effective, even on off-size pipe.

High, uniform "pack" all the way around for a *permanently* tight repair on leaking bell-and-spigot joints.

DRESSER BELL-JOINT CLAMPS

ONE OF THE DRESSER INDUSTRIES

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pennsylvania.
In Texas: 1121 Rothwell St., Houston. In Canada: 60 Front St., W., Toronto.
Sales Offices: New York, Chicago, Houston, San Francisco



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DEPENDABLE PERFORMANCE SINCE 1901

Iron Body Gate Valves
Iron Body Check Valves
Iron Body O.S.Y. Valves
Iron Comp. Flanges
Iron Flange Unions

"A" TRADE MARK

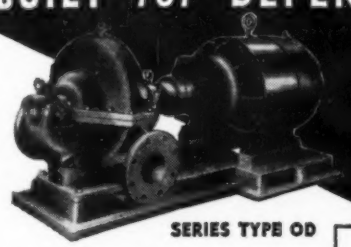
Brass Pipe Fittings
Brass Gate Valves
Brass Globe Valves
Brass Check Valves
Brass Radiator Valves
Brass Gas Cocks

AMERICAN VALVE MFG. CO. Coxsackie, N. Y.

N. Y. OFFICE & WAREHOUSE: 37-25 32ND ST., LONG ISLAND CITY 1, N. Y.

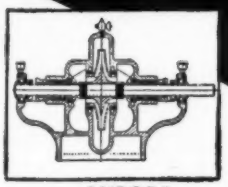
BUILT for DEPENDABILITY

AURORA HORIZONTALLY SPLIT CASE DOUBLE SUCTION SINGLE STAGE CENTRIFUGAL PUMPS *"by Aurora"*



SERIES TYPE OD

The ultimate in design and perfection — type OD pumps — in capacities to 4,000 G.P.M. and heads to 300 ft. — are accessible, compact and lasting. They are widely used for general water supply, for municipalities, industrial buildings and institutions. Also for handling condenser circulating water, liquids in paper mills and distilleries, chemical solutions, oil in oil fields and refineries, irrigation, etc.



AURORA CENTRIFUGAL PUMPS — are also available in HORIZONTALLY SPLIT CASE TWO STAGE DOUBLE SUCTION • SIDE SUCTION • VERTICAL • NON CLOG • SUMP • MIXED FLOW • DEEP WELL TURBINES • and SPECIAL DESIGN.

Write for CONDENSED CATALOG "M" or CONSULT SWEETS

APCO TURBINE-TYPE PUMPS

Here's the Pump for "1001" duties. SIMPLE — only one moving part, the impeller. Capacities to 150 G.P.M., Heads to 600 Ft. Slight change in capacity against drastic head variations.

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS — AURORA PUMP COMPANY

68 Loucks Street, AURORA, ILLINOIS

SLASH PIPE INSTALLATION COSTS

SAVINGS UP TO 80% - 85% NOT UNCOMMON

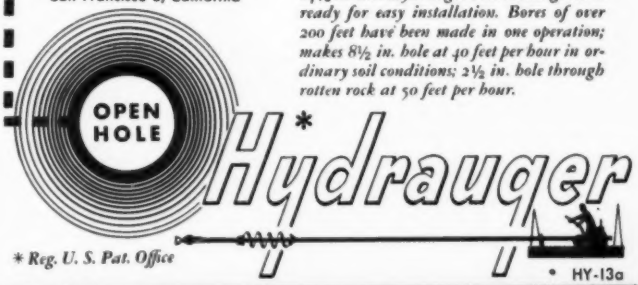
HYDRAUGER operation SAVES TIME and lots of it! With man-hour costs HIGH, it is wise ECONOMY to equip your crews with TIME SLASHING HYDRAUGERS.

The reason for HYDRAUGER ECONOMY is very simple. It bores a clean, open hole, horizontally through all formations; does it without paralyzing traffic, wrecking pavement, lawns, gardens, etc.

Write for Catalog No. 8 TODAY!

HYDRAUGER CORP., Ltd.
681 Market Street
San Francisco 5, California

The powerful air-driven HYDRAUGER machines (3.2 and 5.2 horsepower) bore and ream any size open hole from 2 in. through 14½ in. The Hydrauger bore is straight and ready for easy installation. Bores of over 200 feet have been made in one operation; makes 8½ in. hole at 40 feet per hour in ordinary soil conditions; 2½ in. hole through rotten rock at 50 feet per hour.



* *Reg. U. S. Pat. Office*

• HY-13a

EARTH BORING TOOL

The SEWER SCOOTER

(U. S. Patent 2,198,823)

THE ONLY 100% SELF-PROPELLING SEWER CLEANER

THE FLUSHING ACTION IS APPLIED BY COLLAPSING THE SHIELD.

A patented feature

No Preliminary Work— Gets Results in a Hurry

SEWER SCOOTER MODEL A-3, BRONZE

Standard machines stocked 8 inches to 96 inches—For sale, rent or contract.

J. C. FITZGERALD

Box 289-A
Coral Gables 34, Fla.

etc. It also prevents corrosion and rust.

NoDrip plastic coating may be applied like plaster with a trowel, brush, or spray to tanks, ceilings, walls, pipes, etc. Ordinary conditions require ¼ in. thickness which gives a coverage of about six sq. ft. of flat surface per gallon. The material requires no maintenance and is self-bonding. It is recommended not only for the prevention of sweating on pipes and tanks, but also for decreasing the heat loss from pipes. It is obtainable in drums of 1, 5, and 55 gallons.

Further information may be obtained by entering the above key number on a Reader Service Card.

Centriline's One-Millionth Foot

Centriline Corp. of New York celebrated the lining of the one-millionth foot of water main with cement mortar by the Centriline process on April 21.

A demonstration was made at Newark, N.J., where the company is in process of cleaning and lining approximately 68,000 ft. of cast iron and steel water mains.

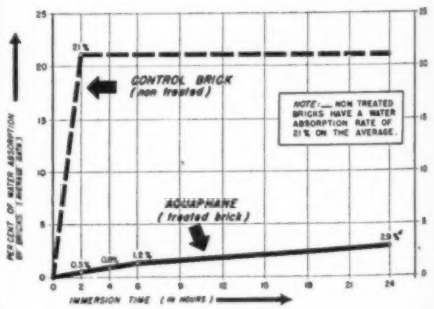
The accompanying photograph shows a number of waterworks engineers who assembled to watch the demonstration at Newark.

607

Transparent Waterproofing Coating

International Aquella Products, Inc., Rockefeller Center, N.Y., has developed a new transparent coating to be applied to common brick and porous masonry walls. Known as

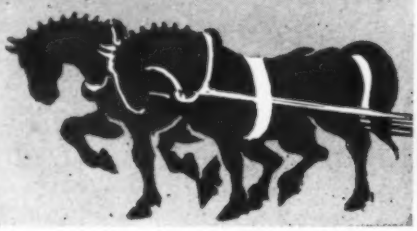
LABORATORY TESTS ON WATER ABSORPTION OF COMMON POROUS BRICKS TREATED WITH *AQUAPHANE*



Aquaphane, its purpose is to prevent penetration of rain, dampness, snow, sleet, or water.

Aquaphane consists of a highly dispersed water repellent organic ingredient. It is an emulsion and has a milky white appearance, but after application is absolutely transparent. In the emulsion form it is stable at temperatures from 40 to 160 deg. F. As a coating it will withstand temperatures up to 212 deg., is non-toxic and non-inflammable.

TWO
"WORK HORSES"



THE BEST TEAM
For The Long Pull

RENSSELAER Gate Valves and Fire Hydrants: the *reliable* team to which you may confidently hitch your Water Works "wagon."

What other "team" has received such universal approval from coast to coast? Obviously it has become an accepted fact that "It Pays to Buy the *Best.*"

RENSSELAER VALVE CO.

Ask the man who uses Rensselaer!

TROY, N. Y.

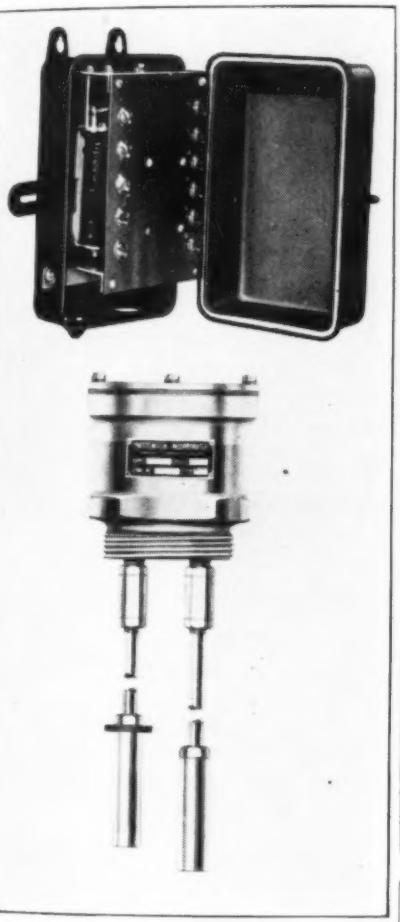
According to the information released by the company, Aquaphane reduces water absorption by more than 90 per cent when applied to porous (common) brick. It is applied by ordinary brush; it can be applied to either moist or dry surfaces and it will not affect the color or texture of a wall surface.

Further information on this new protective coating for masonry walls may be obtained by entering the above key number on a Reader Service Card.

608

Level Control

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass., has introduced a completely maintenance-free level control for chemical processing industries. Known as Photoswitch Type 10CB1 this control consists of an electric relay operating from a probe circuit through a transformer and a rectifier. It may well find use in electrically conductive liquids such as water, milk, beer, aluminum sulfate, ferric chloride, etc., and other coagulating chemicals.



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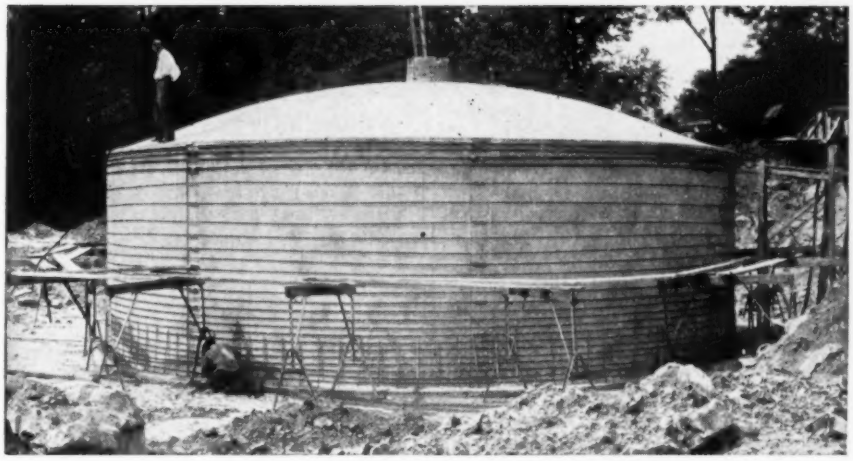


• PRE-STRESSED "GUNITE" •

The picture shows a partially completed 40' diameter, 110,000 gallon pre-stressed "GUNITE" tank with a "GUNITE" dome roof, designed and built by us.

When this photo was made the tank was filled with water for leakage test. After the test showed the tank to be bottle-tight, two inch mesh reinforced "GUNITE" was placed over the outside to permanently protect the pre-stressed hoop rods. The tank was subsequently covered with earth, with 12" of fill over the dome.

This photo illustrates our method of pre-stressing the hoop rods by means of several turnbuckles in each hoop.

Our Bulletin C2300 describes and illustrates pre-stressed "GUNITE" construction in detail and also scores of other uses of "GUNITE."

Write today for your free copy of Bulletin C2300.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

COAGULATE WITH N-SOL

Plants with high turbidity water use N-Sol (activated silica sol) to solve the problem. N-Sol coagulant aid produces larger, denser floc which results in filtered water with the sparkle of spring water. N-Sol is prepared conveniently in your plant with "N"® Silicate. Get samples of "N" and directions for jar tests to prove N-Sol efficiency.

® *Phila. Quartz Co.*

N-Sol-A* — N Silicate reacted with ammonium sulfate. Used where chloramine sterilization is desired.

N-Sol-B — N Silicate reacted with alum. (U. S. Pat. 2310009)

N-Sol-C* — N Silicate reacted with Chlorine. The residual hypochlorite retains the same oxidizing powers produced by normal chlorine sterilization.

Baylis Sol — N Silicate reacted with sulphuric acid. (U. S. Pat. 2217466)

N-Sol-D* — N Silicate reacted with sodium bicarbonate.

* Patent Applied For.

N-SOL PROCESSES FOR WATER COAGULATION

PHILADELPHIA QUARTZ COMPANY
Dept. C, 121 S. 3rd St., Phila. 6, Pa.

National Water Main Cleaning Demonstrated in Santiago

At the recent Congress of the Inter-American Association of Sanitary

Engineers held in Santiago on April 8 to 14, R. L. Hardman, Chief Engineer of National Water Main Cleaning Co., presented a paper on New Practices in Water Main Cleaning and demonstrated his paper with a scale model of a National Water Main Cleaning head passing through a transparent model of a water main complete with bends, joints, elbows, etc.

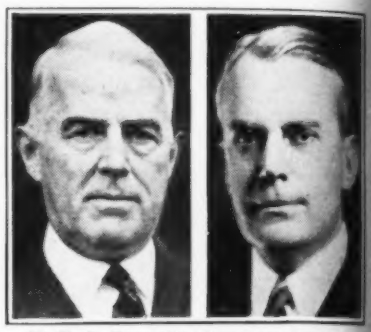
A. J. Krell Joins Layne-Texas Co.

Announcement has recently been made by The Layne-Texas Co., Ltd., Dallas, Tex., that A. J. Krell has joined the company in charge of their new program on the sale and application of water treatment.

Mr. Krell has a wide experience in the field of water and sewage treatment, having at one time been associated with Will B. Raisch, consulting engineer in New York City, the Sanitary Corps of the Army, Interstate Sanitation Commission of New York and as industrial waste engineer with the National Aniline Co. in Buffalo, N. Y.

U. S. Pipe Officers

N. F. S. Russell, president of the United States Pipe and Foundry Co., has been elected chairman of the board, and Gen. Donald Armstrong, executive vice-president, has been elected president at the recent meeting of the board of directors of the company.



N. F. S. Russell Gen. Don Armstrong

Mr. Russell relinquishes his active direction of affairs after serving 25 years as president of the company.

Prior to coming with the company, Gen. Armstrong was assistant chairman of the executive committee of the American Standards Association. He served in the Army for 37 years.

609

Detection of Pinholes in Technical Coatings

If you are interested in an instrument for the detection of pinholes, skips, etc., in technical coatings, you will probably be interested in a new device being offered by The Gregg Co., 1418 Walnut St., Philadelphia 2, Pa.

The machine is designed so it can be plugged into a 110-60 cycle outlet, or attached to the battery of an automobile or dry cells. It weighs only 15 to 20 lbs. A meter shows the voltage and a Neon light on both the instrument and the operator's brush will designate the presence of a pinhole. The device may be regulated to produce from one to 10,000 volts D.C. with only 0.0002 amps. or less. This machine is designed to find many uses, not only in detecting pinholes and skips but also the number of coats or thickness of a finished film on surfaces.

FOR WATER CONDITIONING

SOLVAY
TRADE MARK REG. U.S. PAT. OFF.

ALKALIES CHEMICALS

SINCE 1881

For Water Softening
• • • SOLVAY SODA ASH

For Water Purification
• • • SOLVAY LIQUID CHLORINE

For Water Technical Service
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ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

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Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

D

WEEDS are OUT at water works installations

DOLGE SS WEED KILLER

can be used to advantage in all areas containing water works installations, where no vegetation whatever is desired. Sprinkled on, in economical dilution, this formula works down to the roots, so that it destroys not only surface growth but the entire vegetable structure . . . particularly important where stand pipe locations must be considered. Keeps the growth down around high reservoirs; with proper application there is no danger that the solution will work into storage facilities.

E.W.T. Selective Weed-Killer

(2-4-D) maintains your landscaping but eliminates noxious weeds. Non-injurious to most grasses, E.W.T. aids in keeping a "well-groomed" appearance to the grounds around your pumping plant, purification plant, storage facilities and administration building.

Both DOLGE WEED KILLER and E. W. T. SELECTIVE WEED KILLER have their place in your ground maintenance program. They forestall hours of expensive labor devoted to weeding by "going to the root" of the weed problem.

GET ALL THE FACTS!

Write for DOLGE'S brand-new booklet

"CHEMICAL WEED CONTROL"

—Contains complete, up-to-the-minute information on how to deal with your weed problems swiftly, economically and *lastingly*.

The C. B. DOLGE CO.
WESTPORT, CONNECTICUT

For further information on this unique instrument, enter your name and the above key number on a Reader Service Card.

610

Plastic Pipe

United States Rubber Co. has developed a new corrosion-proof plastic pipe, for use in chemical manufacturing and other industries.

The pipe is made of Kralite, a blend of synthetic rubber and thermoplastic resins. It can be supplied in rigid and semi-rigid forms in sizes ranging from ¼ to 2 in. outside diameter, and it may be bent to various radii and threaded for fittings.

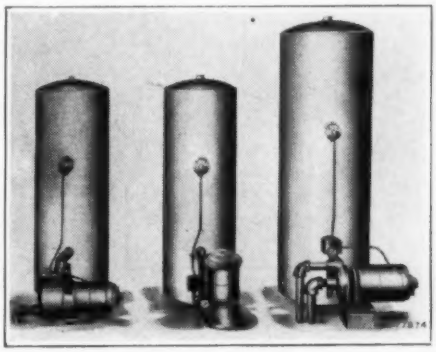
For further information on this corrosion-proof plastic pipe, address a Reader Service Card with the above key number.

611

Domestic Water Pump Systems

Ingersoll-Rand Co., 11 Broadway, New York, has announced a complete line of domestic water pump systems, designed for both shallow and deep wells.

Pumps operate on the jet principle and are suited to any location where city water mains are not available, including summer homes, clubs, dairies, laundries, amusement parks and small factories, etc., who must have their own water supply.



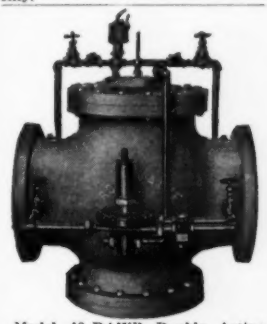
Three types of pumps are included in the line: the vertical deep well pump which lifts up to 90 feet, delivering 215 to 625 gallons per hour, depending on motor size and depth of water level; the horizontal deep well pump for higher lifts and greater water delivery, and the shallow well unit for lifts of not more than 25 feet. This type of pump may also be of interest to sewage plants not located on the municipal water main.

For further information enter the above key number on a Reader Service Card.

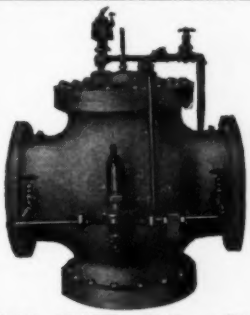
Est. 1879

ROSS AUTOMATIC VALVES

Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require direct pumpage.



Model 30-AWR Single acting valve may be controlled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

ROSS VALVE MFG. CO.
Incorporated
P.O. BOX 595, TROY, N.Y.

Universal Concrete Pipe Co. Adds Small Sizes

Universal Concrete Pipe Co. of Rochester, N.Y., has announced the addition of small size sanitary sewer pipe to its line in an expansion move at its Rochester plant.

Whereas the company had previously concentrated on large reinforced concrete pipe that ranged up to 72 in. in diameter, they will now manufacture pipe from 4, 6, 8, 10, and 12 inches.

Universal Concrete Pipe has plants located in Syracuse, Port Washington, and Binghamton, N.Y., as well as in New Jersey, Pennsylvania, Georgia, Alabama, West Virginia, and Tennessee. The main office is at Columbus, Ohio.

612

Curb Box Equipment

V. E. Beagle Co., Alexandria, Va., has available a combination curb box key and box cleaner made in two lengths, 5 ft. and 5 ft. 6 in. long.

The company also makes a Little Sentinel Curb Cock Adapter and a Star Universal Double Locking Repair Lid.

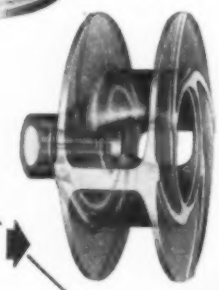
The purpose of the Little Sentinel Curb Cock Adapter is to provide the cock with a perfect bearing and base and eliminate the danger of breakage and misplacement caused by earth settling or thrust on top of the box by vehicles or other source.

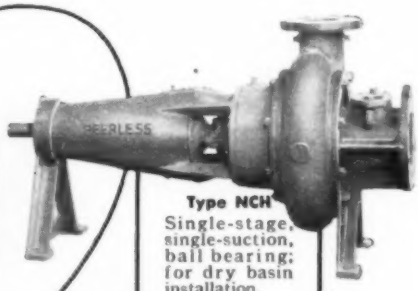
Further information on these several items which are of interest to all water companies' distribution departments may be obtained by entering the above key number on a Reader Service Card.

Non-Clog IN ACTION
AS WELL AS IN NAME

Wherever the improved Peerless Non-Clog Pump is installed, it lives up to its name by offering positive *non-clog* pumping action. All wearing rings, end plates, filler rings, etc., have been discarded in the Peerless design, in favor of an improved impeller with unique repelling vanes on both of its outer shrouds. These repelling vanes provide a pumping action similar to the working vanes between the shrouds, preventing accumulation of solids in the space between the impeller and casing side walls by agitating the solids into the center flow of the fluid stream. Specify Peerless Non-Clog Sewage Pumps for trouble-free service and economy in sewage treatment and relift stations.

Type NCV
Capacities: 100 to 7000 g.p.m.
Heads: 12 to 70 feet





Type NCH
Single-stage, single-suction, ball bearing; for dry basin installation.

THE IMPELLER IS THE HEART OF ANY PUMP

These improved sewage pumps utilize a two port impeller with unique repelling vanes on outer shrouds. Scientifically designed working vanes of uniform thickness develop positive pumping action. Peerless' constant experimentation and unique impeller design has resulted in a dependable means of pumping entrained solids.

PEERLESS NON-CLOG SEWAGE PUMPS

PEERLESS PUMP

REQUEST BULLETIN: All Peerless improvements and advantages in non-clog sewage pump design are described in this new bulletin. Write for No. B-154.

PEERLESS PUMP DIVISION • *Food Machinery Corporation*

Factories: Los Angeles 31, Calif.; Quincy, Ill.; Indianapolis, Ind.
District Offices: New York 5, 37 Wall St.; Chicago 40, 4554 No. Broadway; Atlanta Office: Rutland Bldg., Decatur, Georgia; Dallas 1, Texas; Fresno, California; Los Angeles 31, California

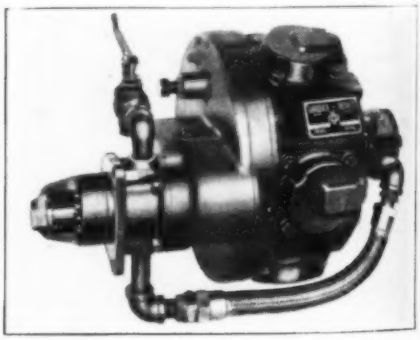
G. W. Bostrom Exec. Secy. Soft Water Service Operators

Glenn W. Bostrom, formerly of the Industrial Merchandising Staff of Colonial and Diamond Crystal Salt, Div. General Foods Corp., has been appointed executive secretary of the National Assoc. of Soft Water Service Operators, Chicago.

613

Air Starters

Gardner-Denver Co. of Quincy, Ill., has announced a new line of air starters for gas, gasoline and Diesel



engines. These include five sizes, developing from 3 to 15 horsepower on 100 pounds air pressure.

The principal advantages of these air starters are their extremely high torque and the elimination of costly battery maintenance and replacements.

If you are interested in this item, fill in a Reader Service Card with the above key number and mail.

HYDRANTS and VALVES

Expert workmanship and highest quality materials make M & H products a good investment always. Many years of use in all sections of the country has proved their ruggedness and dependability.

M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model designed to yield at the ground line under impact.

Write for Catalog No. 34

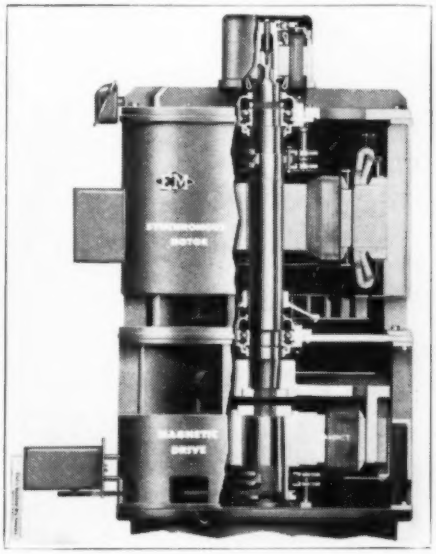
M & H PRODUCTS
Fire Hydrants
Gate Valves
Tapping Valves
Special Castings
Tapping Sleeves
Check Valves
Floor Stands
Extension Stems
Mud Valves
Flap Valves
Sludge Shoes

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

614

Adjustable Speed Drive for Centrifugal Pumps

Electric Machinery Mfg. Co., Minneapolis 13, Minn., has newly available a "Vertical Synchronous Motor Magnetic Drive Unit" for giving smooth adjustable speed control to centrifugal pumps. The motor drives the ring of the magnetic drive at constant speed. The magnet member of the magnetic drive is mounted on a gear shaft which operates the pump at speed required by the liquid level control.



The photograph shows a 250 hp., 1200 rpm. vertical synchronous motor magnetic drive unit operating a 200 rpm. vertical sewage pump through a reduction gear.

Enter the above key number and your name on a Reader Service Card for further information on this unit.

615

Motion Picture About Aluminum

The Motion Picture Dept. of the Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19, Pa. announced the completion of a new sound picture in technicolor. Titled "Curiosity Shop," the picture contains the human biography of aluminum. This is a continuation of the story started in Alcoa's first documentary film titled "Unfinished Rainbows".

In the earlier picture Alan Ladd played the part of Charles Martin Hall. In the present picture John Litel portrays Gordon Harkness, research and development engineer, and June Lockhart plays his daughter.

If you are looking for a movie for your program after July 1, fill in a Reader Service Card with the above key number.

HAVE YOU TRIED stainless steel

Memphis Slot Inserts

with new

bronze thrust rollers?

PATENTED

SAVE MONEY, LABOR, MEASURING CHAMBERS with this simple device, easily installed, made to fit water meters varying in size from ⅝" to 2'. By lining ragged roller slots, the Memphis Slot Insert adds years to the life of measuring chambers and provides remarkable accuracy in water registration.

For free ⅝" samples, send the coupon below to the

METER SPECIALTY CO.
Office: Sterick Bldg.
Factory: 1332 N. Seventh St.
MEMPHIS, TENNESSEE

Please send me free samples of Memphis Slot Inserts to fit ⅝" water meters of the following makes:

.....

.....

Your Name..... Title.....

Company .....

Address .....

.....

616

Leveltronic Relay

A Leveltronic Relay for liquid level control, recently introduced by R-S Products Corporation of Philadelphia, Pa., has an added feature; it is now constructed so that direct or reverse action is possible at no extra cost. This feature provides for fail-safe action on line failure, or a tube becoming inoperative, thereby protecting against overflow or underfilling of process units.

The company's Catalog No. 27 carries full details about this relay and its operating features. If you desire further information enter the above key number on a Reader Service Card.

Portland Cement Builds Research Lab.

The Portland Cement Association of Chicago has received bids for the construction of a large and modern research laboratory to occupy a 15 acre tract in the northern part of Skokie about 15 miles north of Chicago.

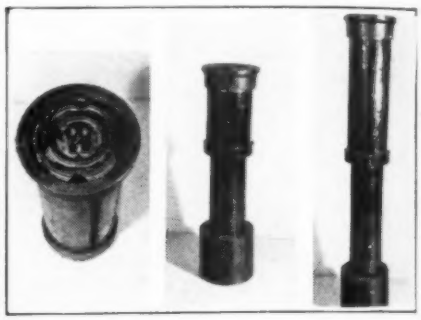
The buildings will have a total floor area of approximately 98,000 sq. ft., and will contain more than 25 specialized laboratories as well as an auditorium, technical library, reading room, and a cafeteria.

617

New Valve Boxes

Orangeburg Manufacturing Co., Inc., Orangeburg, N.Y., has introduced a line of valve boxes made from the famous Orangeburg conduit pipe. This Orangeburg pipe is composed of approximately 25 per cent by weight of trough fibrous structure and 75 per cent hard coal tar pitch thoroughly saturated under vacuum.

The pipe has long been used for underground electrical conduit, for outdoor drainage work, for underground non-pressure sewer and conductor services, and in some instances in sewage plants to carry supernatant liquor, etc.



These new valve boxes which are light in weight, averaging only 27 lbs., are easy to handle, last a lifetime, will accommodate valve sizes from 4 to 10 inches. They can be used in varying trench depths of 3 to 6 ft., depending on the valve size. Consisting of a two-piece sliding type shaft, these valve boxes have cast iron covers.

Water distribution departments should be interested in these items. For further information enter the above number on a Reader Service Card.

Neptune's J. D. Thompson Dies

John D. Thompson, New York representative of the Neptune Meter Co., died suddenly early in April. Mr. Thompson joined the Neptune Meter Co. in 1917 and since 1926 has been sales representative for the State of New York. He was active in the New York Section of A.W.W.A., and was a member of the Neptune Twenty-five Year Service Club.

"EASY DOES IT"

QUICKER—
STRONGER, TOO . . .

Patent Applied For

with HAYS "DUO-STOP"
Combination Corporation Stop and Saddle
for Cast Iron or Steel Pipe

It's quick . . . it's simple . . . it's safe. It's the corporation stop that water companies and municipalities have needed for a long time. Especially today, with the large scale housing projects and the demand they put on the service department, the Hays "Duo-Stop" is an important time-saver in making connections to small mains.

There's no interruption of service . . . there's no tapping of the main . . . there's no weak spot in the connection.

The "Duo-Stop" Combination Corporation Stop and Saddle is strong . . . stop and service clamp are of one-piece solid, rust-proof bronze . . . it is pressure-tight and leakless.

The Hays "Duo-Stop" is built to serve and built to last.

Write today for Folder 105

HAYS
COPPER · BRASS · LEAD · IRON
WATER WORKS PRODUCTS
HAYS MANUFACTURING CO., ERIE, PA.

618

Electronic Liquid Level Control

The Lumenite Electronic Co., 407 S. Dearborn St., Chicago 5, Ill., is offering a new caseless model Faratron. This Model FE is a very compact unit, being only 4½ x 4¾ x 3½ in. deep. It is designed to meet the broad demand for an electronic control of liquid levels.

The model is offered in two standard types, one for one-level operation and the other for two-level operation. The first will operate either at high or low, and the second will operate at both high and low levels.

Information on this new unit is obtainable. Just address a Reader Service Card with the above key number.

Wrought Iron Pipe Line at Tarentum, Pa.

Lane Pump Co. of New York has installed two wells and pumping facilities at Tarentum, Pa. to serve the Tarentum Products Co., manufacturers of paper and fiber box.

The line to carry this water to the boiler plant is of 10 in. wrought iron pipeline manufactured by A. M. Byers Co. The line is laid through cinder fill and as an added precaution the corrosion-resistant wrought iron pipe was coated and wrapped before installation.

PORTABLE GATE OPERATORS

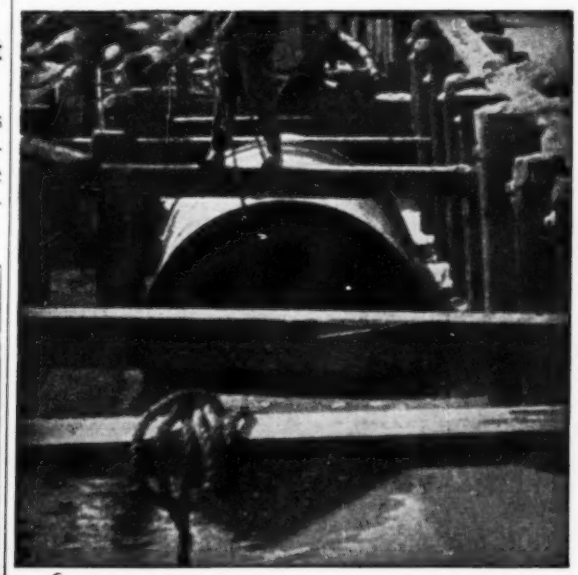
A

B

C

A. The Gatender. A Portable Gasolene Power Operator
B. The Powerench. Gas Engine Driven Unit for all Gates
C. Truck Mounted for Big Gates Under Pressure

PAYNE DEAN & CO., MADISON, CONN.



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2 TO 84

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

Hall Laboratories Transfer Engineers

Hall Laboratories of Pittsburgh have made a three-way transfer of service engineers in the Pittsburgh, Cincinnati, and Birmingham districts.

Leonard Highley, Jr., returns to the Pittsburgh home office after nine years in Birmingham. G. Howard Smith was transferred from Cincinnati after four years to the Birmingham district, and Robert G. Hobek, who has been in laboratory work with the company, was transferred to the engineering staff in Cincinnati.

Economy Pumps News

Economy Pumps Inc., Hamilton, Ohio, have announced the opening of a new sales office in Chicago and the appointment of a new distributor in Grand Rapids, Mich.

Beldon S. Tucker has been appointed district sales manager for the Chicago office, and Bruce Hetler is the new Economy Pumps distributor for western Michigan.

Link-Belt Moves Schenectady Office to Albany

Link-Belt Co. has announced the opening of a district sales office in Albany, N.Y. Mr. J. Charles Bullock will be in charge of the office with headquarters at 309 First Trust Co. Bldg., 444 Broadway, Albany 7, N.Y.

Mr. Bullock has served as district sales manager at Schenectady, which office is now closed.

The Mathews Firemen say

And for what reason? Because Rochester, N. Y. depends on Mathews Hydrants, and Mathews Hydrants have been proving for over 75 years that they *can* be depended on. Wherever there's a Mathews, there's safety plus.

The stem is permanently corrosion-proof, the revolving nut effectively sealed against rain, dust and dirt. The main valve is true compression-type, the drain valve positive and automatic. All the working parts are housed in a removable barrel, easily replaced in a few minutes, and thus saving costs—perhaps even life and property. It is designed for long and trouble-free service—that is why it is depended on the world over.

Send for our illustrated booklet describing these great hydrants in detail. See why there are more than 400,000 in use today, and why Rochester, N. Y. can be said to be one of America's safest cities.

OTHER MATHEWS FEATURES: Head can be rotated 360° • Replaceable head—nozzle outlets easily changed • Nozzle levels raised or lowered—no excavating • Stuffing-box plate integral with nozzle section—strong, safe, leakproof • Practically no maintenance required • Only one part to oil—the operating thread.

MATHEWS HYDRANTS

***Made by* R. D. WOOD COMPANY**

Public Ledger Building, Independence Sq., Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

LITERATURE AND CATALOGS

619

MAIN LINE METERING

The latest catalog on the subject of main line water measuring equipment, issued by R. W. Sparling, Terminal Annex, Box 3277, Los Angeles, Calif., is their general catalog **Bulletin No. 310, No. 325-11126,5M.**

This bulletin is replete with cutaway photographs and diagrams of the various Sparling main line water meters, and typical pump station installations. Pictures and diagrams show compound meters, auto-metered equipment, auto-metered chlorination and chemical feed control, and other dependable station equipment. A large chart shows accuracy and head loss curves for different sizes of Sparling meters. Auxiliary equipment such as Striptograph recorders and equipment for special requirements, remote control, etc., are also presented in this catalog, as is the Venturi flow meter.

This is a complete catalog which every water distribution system should have in order to be up to date on the subject of main line water meters.

To obtain a copy of this bulletin, enter the above key number on a Reader Service Card and mail.

620

"TRANSITE" PIPE

Johns-Manville, 22 E. 40th St., New York 16, N.Y., has issued a 32-page bulletin on **Transite Pressure Pipe** recommended for efficient, economical water transportation.

The book is replete with pictures of installations, diagrams on operation, information on loss of head, carrying capacity, and other technical data. There is also a section devoted to the type of coupling used to minimize underground leakage; a series of photo-

FEED-METERS-MIXES
CHLORINE GAS ACCURATELY

PURIFICATION FOR WATER-SEWAGE & SWIMMING POOLS

Everson SterElators Operate Manually or Semi-Automatically, Also Automatically Proportion Gas Flow to Water Flow.

Everson SterElators Utilize a 24" Water Gauge Vacuum and Visible Flow Meters, with Wide Ratio Ranges of Capacities: 10 to 1, 50 to 1, 110 to 1.

All SterElators Are Dependable, Accurate, Safe and Easy to Operate. Guaranteed to Give Complete Satisfaction. NO JOB TOO LARGE

Send us Copy of Specifications

SterElators by Everson

EVERSON MFG. CORP.
233 W. Huron Street
Chicago 10, Ill., U. S. A.

WRITE FOR THIS BULLETIN

FOR

pH Control
and WATER TESTS

A study of our 28-page Bulletin No. 602, containing the complete line of Hellige apparatus for pH control and water analysis, will enable you to form an intelligent opinion as to what is best suited for extending your present equipment or for an initial installation.

HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

graphs shows proper methods of installation, and other sections of the bulletin are devoted to steps of production, testing, and quotations from reports by users at many installations.

A copy of this interesting and informative booklet is available on request. Just fill in a Reader Service Card with the above key number and mail.

621

WATER CONDITIONING

Permutit Co., 330 W. 42nd St., New York 18, N.Y., has issued a bulletin titled **Permutit Water Conditioning Headquarters for Over 35 Years.**

This bulletin is issued in eight pages and explains the difficulties of hard water, and corrosive water, and pictures various installations of water treatment equipment for various purposes, including chemical feeds, hot and cold process water, aeration, household equipment, etc. Two pages of the bulletin are devoted to description of equipment to suit every water conditioning need. This includes water softening, demineralizing, special applications, water filters, iron removal equipment, chemical feeds, coagulation equipment, etc.

A copy of this bulletin may be obtained by entering the above key number on a Reader Service Card.

622

CALCINING LIME SLUDGE

The Dorr Co., 570 Lexington Ave., New York 22, N.Y., has issued a bulletin on **The Dorrco FluoSolids System.** This bulletin is a reprint of two articles on the subject of the Fluosolids Process. It explains how fluidization, which is a successful tool in refinery processes, has been expanded into such fields as limestone calcination. By means of this process lime sludge from water softening can be converted to pellets of lime which can be used again in the softening process. These pellets make for easy dry feed.

A copy of this bulletin may be obtained by entering the above key number on a Reader Service Card.

623

REPAIR SLEEVE

If you want a one-sheet bulletin on the **Dresser Adjustable Repair Sleeve Style 82,** you can fill in the above key number on a Reader Service Card and mail.

This bulletin shows six easy steps to install this item for making repairs and service connections on water lines.

LEADITE
The Pioneer Self-Caulking Material for C.I. Pipe

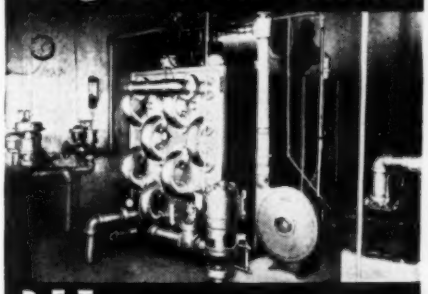
TABLE OF COMPARATIVE QUANTITIES

Nominal inside dia. of pipe, in.	Depth of joint, inches of Leadite	Approx. lbs. of Leadite per joint	Depth of joint, inches of lead	Approx. lbs. of lead per joint.
4	2.5	2.00	2.25	8.56
6	2.5	3.00	2.25	11.71
8	2.5	4.00	2.25	14.63
10	2.5	5.00	2.25	17.70
12	2.5	6.00	2.25	20.86
14	2.5	7.00	2.25	24.02
16	2.5	8.25	2.25	33.07
18	2.5	9.25	2.25	36.88
20	2.5	10.50	2.25	41.71
24	2.5	13.00	2.50	53.02
30	2.75	16.00	2.50	65.36
36	2.75	19.00	2.50	77.96
48	3.50	30.00	3.00	121.15
54	4.0	38.00	3.00	135.60
60	4.0	42.00	3.00	150.70

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

A Better Way of Heating Sludge Digestion Tanks



P.F.T. DIGESTER HEATER AND HEAT EXCHANGER

. . . does away with constantly decreasing heat transfer, greatly reduces the labor of cleaning coils, and minimizes the operating interruptions encountered in the conventional method of heating digestion tanks. Ask for Bulletin 135.

P.F.T. PACIFIC FLUSH TANK CO.
4241 RAVENSWOOD AVE., CHICAGO
NEW YORK • CHARLOTTE, N. C.
SAN FRANCISCO • LOS ANGELES

624

VALVES AND HYDRANTS

Darling Valve & Mfg. Co., Williamsport, Pa., has issued Catalog No. 17M on **Valves, Fire Hydrants and Accessories.**

This 302-page bulletin is a complete catalog on all types of gate valves for water, steam, gas, etc., and all types of fire hydrants, and accessories connected with water distribution systems.

In addition to pictures, diagrams, and data on each of the different types of valves, hydrants, and accessories presented, there are a number of pages of technical data on relative carrying capacities, discharge of air through orifices, temperature conversion, etc.

To obtain a copy of this handy catalog bulletin, enter the above key number on a Reader Service Card and mail.

625

ION EXCHANGE MATERIALS

National Aluminate Corp., 6220 W. 66th Pl., Chicago 38, Ill., has announced the availability of a new booklet on ion exchange principles, properties and uses; and technical data on materials.

Section I of the booklet is a general discussion of ion exchange principles, etc; Section II presents technical data on each of the commercially available types of ion exchange materials produced by the company; and Section III contains brief notes on a number of chemical manufacturing and processing operations employing ion exchangers.

If you desire a copy of this very interesting booklet, just enter the above key number on a Reader Service Card and mail.

626

WHY WATER ANALYSIS

Gilbert Associates, Inc., Reading, Pa., have prepared an interesting booklet on **Why Water for Steam Boilers Should Be Treated and Analyzed.**

This attractive and informative booklet explains why water must be treated, the objectives of treatment, the prevention of scale and deposits, protection against corrosion, elimination of carryover, embrittlement protection, removal of dissolved solids, and common impurities in water. Also discussed are the subjects of boiler outages, boiler efficiency, and fuel and maintenance savings.

A full map shows the hardness of waters throughout the country, and a section of the bulletin is devoted to corrective methods of treatment control, treatment of boiler saline, and proper sampling of water.

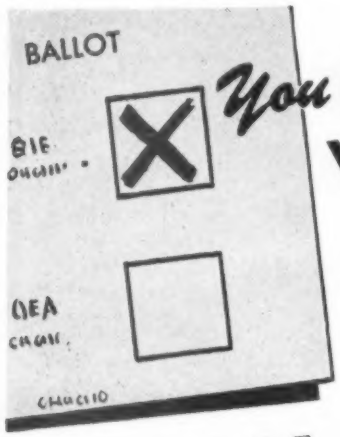
The booklet concludes with discussions of hydrogen ion concentration, total solids, routine chemical analyses, and relations of alkalinity.

For anyone dealing with boiler water supplies, this is a handy book to have. It may be obtained by entering the above key number on a Reader Service Card.

627

ELECTROLYTIC FLOCCULATION

Alhydro, Inc., 516 N. Charles St., Baltimore 1, Md., has issued a four page folder on the **Alhydro Floc Producer,** "the electronic method for flocculating water for industrial and potable use". The folder explains how the equipment uses low voltage current and aluminum electrodes to produce aluminum hydroxide floc. Shown in diagram is the equipment for introducing the method into the coagulation system. Cut-away drawings and photographs illustrate the operation of the Alhydro Floc Producer, and the descriptive matter contains a list of the several advantages to be gained from the use of the equipment.



You Get the Community
VOTE for EXTRA Savings and EXTRA Service in Sewage Plant Operations with a
ROYER
SLUDGE DISINTEGRATOR

Know any better way to earn credit for good management than turning a loss item into a profit? Here's how . . . convert your sewage sludge into a marketable fertilizer by putting it through a Royer. You benefit the whole community by increasing plant growth, and the revenue from fertilizer sales will offset other plant expenses. The cost? Far less than you now pay to burn or bury it. And it's so easy! Just shovel sludge cake from drying beds into the Royer hopper and this sturdy, inexpensive machine does all the rest . . . freeing it from trash and excess moisture, shredding it uniformly to pea size, and discharging directly into bags or trucks . . . ready for immediate use by parks, nurseries, golf courses, and florists who are eager to get it. Why not get full information today? Write for "Sewage Sludge Utilization Catalog."

Model NSD-P at Omaha Plant. Delivers 8 to 12 cu. yds. hr.

ROYER
PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.

FREE WRITE FOR THIS BOOK BY DR. HALE
Tells How To
CONTROL ALGAE

•••AN AUTHORITATIVE WORK CONCERNING THE CONTROL OF MICRO-ORGANISMS AND ELIMINATION OF TASTES AND ODORS. This enlarged edition, by Dr. Frank E. Hale,* describes in detail methods of controlling various forms of microscopic life commonly dealt with in water supply systems. Descriptive material includes 48 clear photo-micrograph studies of organisms discussed. ...Many of the most important water works specify Nichols *Triangle Brand* Copper Sulphate. Triangle Brand is available in several convenient sizes for water treatment. Write *today* for details and book.
*(Director of Laboratories, Dept. of Water Supply, City of New York)
THE STANDARD FOR OVER 50 YEARS
NICHOLS
TRIANGLE BRAND COPPER SULPHATE
99% + PURE
MADE BY
PHELPS DODGE REFINING CORPORATION
Electrolytic Refiners of Copper
40 Wall Street New York 5, N. Y.
230 North Michigan Avenue Chicago 1, Ill.

Clean and Descale Your Meters This Low-Cost Way

MANY water works and public service companies report faster meter repairs when specialized Oakite precleaning and descaling materials are on the job. Here's their standard procedure: First, a recommended Oakite alkaline material removes sludge and other deposits. Then, fast-acting Oakite Compound No. 32 removes scale deposits. This easy-to-apply Oakite acidic descalant (inhibited against metal-attack) eliminates brushing and scraping . . . does not harm plastic register parts . . . leaves brass and bronze surfaces with even color . . . prepares parts for protective spray coatings. FREE 26-page Oakite Booklet gives procedures. Write.

OAKITE PRODUCTS, INC.
73 Thames Street, NEW YORK 6, N. Y.
Technical Representatives in Principal Cities of U. S. & Canada
OAKITE
Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

A copy of this bulletin may be obtained by mailing a Reader Service Card on which is entered the above key number.

628

EQUIPMENT CATALOGS

The American Well Works of Aurora, Ill. has bound a complete set of equipment catalogs together to make them more readily available for engineers, managers, and operators.

Included in the group are bulletins on pumps for both water and sewage, grit removal, sludge removal, rotary distributors, screens, bio-activation, grease flotation, aeration equipment, mixing, and activated sludge.

If you are interested in these catalogs fill in a Reader Service Card with the above key number.

629

PROPORTIONING PUMP

Lapp Process Equip. Div. of the Lapp Insulator Co., Inc., Leroy, N.Y., has issued Bulletin No. 262 to describe the **Lapp Pulsafeeder.** This is the piston-diaphragm proportioning pumps for controlled volume pumping of fluids. It contains no stuffing box, and all working parts are submerged in oil. Capacity is adjustable while operating.

The bulletin shows, by illustration, and describes how the Pulsafeeder works, gives construction details, information on sizes and ratings.

This bulletin may be obtained by entering the above key number and your name on a Reader Service Card.

630

PIPE LINING

The Pittsburgh Pipe Cleaner Co., Pittsburgh 6, Pa., has reprinted two articles on the subject of the **Pittsburgh-Eric Reconditioning Process.**

This includes one article presented by George H. Dann, of the Philadelphia Suburban Water Co., before the Four State Section Meeting at Washington in November 1947; a paper by A. B. Anderson, Chief Engineer of the Water and Sewage Division of the Pittsburgh Pipe Cleaner Co., presented in November 1947 before the New Hampshire Section, A.W.W.A.; and an article by A. B. Anderson on the "Economics of Rehabilitation of 3-inch to 24-inch Water Mains," reprinted from the *Journal of the N.E.W.W.A.*

Copies of these reprints are available for the asking. Fill in a Reader Service Card and mail if you desire information on the Pittsburgh-Eric Reconditioning Process.

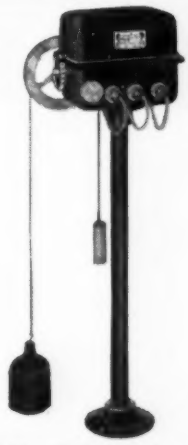
HYDRO-TITE

TESTED FOR OVER 30 YEARS

For more than thirty years water works superintendents have been using Hydro-tite for joining bell and spigot pipe. They have found that this self-caulking, self-sealing compound costs less to buy, requires less labor, makes tighter joints and withstands the effects of time, strain and vibration. Send for data book and sample.

ALWAYS USE FIBREX, the bacteria-free packing for pipe joints. Send for sample.

HYDRAULIC DEVELOPMENT CORPORATION
Main Sales Office: 50 Church St., New York, N.Y.
Works: West Medford Station, Boston, Mass.



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631

PORTABLE PUMPS

Homelite Corp., Port Chester, N.Y., has issued a 4-page folder on the **Homelite Carryable Pumps.** These gasoline-engine-driven pumps are shown in operation and described in the bulletin.

Pumps of various sizes for various uses are available as well as portable generators and blowers. All are gasoline-engine powered.

A copy of this booklet, which has been prepared to give practical information as a guide to choosing the best type of pump for various pumping requirements, may be obtained by entering the above key number on a Reader Service Card.

632

CHLORINATION CONTROL

Everson Manufacturing Co., 214 W. Huron St., Chicago, has available Bulletin No. 1004 on **Vacuum Operated SterElators,** designed for sewage plants, waterworks, swimming pools, and industrial applications.

The bulletin describes a vacuum-operated gas pressure compensator and automatic shut-off, precision metering, one-valve control, and other features such as capacity range, synchronization with pumps, etc.

A copy of this bulletin is available to anyone who desires it. Fill in a Reader Service Card with the above key number and mail.

633

PITOMETER SURVEY

If you are interested in the present day scope of pitometer surveys, perhaps Bulletin No. 23 issued by The Pitometer Co., 50 Church St., New York, N.Y., may be of help.

Titled **The Cole Pitometer System,** this is a reprint of an article which was presented before the New Jersey Section Meeting in 1944. Its information is still up to date, however.

If you desire a copy of Bulletin No. 23, enter the above key number on a Reader Service Card.

634

FIRE RETARDANT WOOD

The Wood Preserving Div. of Koppers Co., Koppers Bldg., Pittsburgh 19, Pa., has issued a 12-page booklet on the subject of **Fire Retardant Wood.**

This bulletin discusses fire hazard ratings of various building materials, the evolution of fire retardant treatments, Underwriters' Laboratories tests of fire retardant wood, and methods of treating wood to make it fire retardant. It also lists applications in which fire retardant wood is of special value.

A copy of this book is yours for the asking. Just enter the above key number and your name on a Reader Service Card and mail.

635

SEALING LEAKS

Sika Chemical Corp. of Passaic, N.J., has published a new folder on their quick-setting compounds, **Sika No. 2 and Sika No. 4A.** Both of these compounds are liquids to be mixed with cement.

The initial set of the resulting mortar can be adjusted to as low as 20 seconds and the final set as low as 30 seconds.

The pamphlet shows the sequence of application and gives detailed instructions for use under various conditions.

If you are interested in quick-setting sealers for pressure leakage in pits, basements, tanks, dams, retaining walls, and the like, you will be interested in this folder. To obtain it, just enter the above key number on a Reader Service card.

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636

INSTRUMENT PANELS

The Falstrom Co., Falstrom Court, Passaic, N.J., has issued a catalog on **Instrument Panels and Cubicles.** Shown in this 8-page bulletin are standard control boards, blueprints of standard panel units and accessories, panels and cubicles for all control needs, standard cubicles, heavy duty cubicles, canopy panel, etc.

A copy of this bulletin may be obtained by entering your name and the above key number on a Reader Service Card.

637

ASPHALT CONDITIONER

Rubber & Plastics Compound Co., 30 Rockefeller Plaza, New York 20, N.Y., has a bulletin No. 201 titled **Nerva-Seal.** This material is a thermoplastic additive for conditioning and strengthening asphalt.

Nerva-Seal imparts its improved qualities to the asphalt with which it is blended, making the resultant asphaltic compound less susceptible to brittleness and cracking in frigid temperatures. It is also more adhesive and maintains its composition in heat where ordinary asphalt will flow.

This product, Nerva-Seal, has a high impermeability to water and moisture vapor, as well as the above mentioned advantages.

It may be used in asphalt marine paint, caulking compounds, coatings for vapor sealing, asphaltic mastics for roofing and flooring, asphaltic coatings for septic tanks and acid containing tanks, coatings for pipe lines in sulphur bearing soils, etc.

If you desire further information on this material, send for this bulletin by using a Reader Service Card on which is entered your name and the above key number.

638

PRECIPITATION RECORDERS

In the No. 30 issue of **The Hydromike,** issued by Leupold & Stevens Instruments, 4445 N. E. Glisan St., Portland 13, Ore., there appears some very interesting information about precipitation recorders, one of which broadcasts the rainfall every hour if it exceeds 0.2 in. per hour.

Also mentioned in this issue is the automatic clock starter which operates recorders only when there is a flow in the stream or storm sewers.

If you are interested in precipitation and flow recorders, fill in a Reader Service Card with the above key number and mail.

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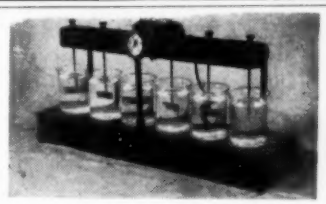

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639

RECARBONATION

Ozark-Mahoning Co., Ozark Chemical Div., Tulsa, Okla., has a 4-page folder Bulletin SCR-1 on **Recarbonation by Submerged Combustion.**

This folder shows the principle of operation, sizes and parts, models, capacity ranges, recarbonating flume, method of ignition, safety features, placement of equipment, etc., in reference to these submerged combustion recarbonators.

Water softening plants in particular should be interested in these units. A copy of the folder may be obtained by mailing a Reader Service Card on which is entered your name and the above key number.

640

WATER CONDITIONING

Cochrane Corp., Philadelphia 32, Pa., has published bulletin 4425 on **Cochrane Rapid Reactors.** This bulletin describes the recently announced cold process softener manufactured by the company.

The bulletin contains a detailed explanation of the process and the operation of equipment. Three general designs are pictured for various ranges and capacities. Typical installations are also described in this 12-page bulletin.

A copy of this bulletin is available on request. Just enter the above key number and your name on a Reader Service Card.

641

CO-TWO UNIT

Walker Process Equipment Inc. of Aurora, Ill., has issued a bulletin No. 7S7 to describe their carbon dioxide producer and diffuser. The bulletin carries the title **CO-Two Unit,** and describes the latest development, operation, and advantages of this unit and its diffuser.

A copy of the bulletin is available. If you desire one, enter the above key number on a Reader Service Card and mail.

642

AUTOMATIC CONCRETE BATCHING

Perhaps until prices come down a bit, large scale construction in the field of water, sewage, and industrial waste treatment may not be the order of the day. Nevertheless, many persons in these fields are thinking of construction and in this connection **Automatic Concrete Batching Equipment** may be of interest.

A four-page folder, issued by the Scientific Concrete Service Corp., 724 Salem Ave., Elizabeth 3, N. J., shows the automatic concrete batching equipment that is now in use on the U. S. Engineer Corps Allatoona Dam in Georgia.

If you are interested, send a Reader Service card with the above key number.

643

VERTICAL TURBINE FIRE PUMPS

The Peerless Pump Division of the Food Machinery Corp., 301 West Avenue 26, Los Angeles 31, Calif., have available a new bulletin No. B-152 on **Peerless Vertical Turbine Fire Pumps.** These pumps are designed to afford a reliable water supply for essential plant fire protection, and are designed especially for instant operation even after long periods of inactivity. Capacity ranges are available from 500 to 2000 gpm. and to operate against heads from 240 to 285 feet.

To obtain a copy of this bulletin on these Vertical Turbine Fire Pumps, use a Reader Service Card on which is entered the above key number.

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644
PIPE LOCATOR

Nilsson Electrical Laboratory, Inc., 103 Lafayette St., New York 13, N.Y., has available a descriptive bulletin and manual on the **Wahlquist Pipe & Cable Locator,** shown in the accompanying photograph.

The bulletin gives directions for the proper use of such a unit, and discusses the accessories needed for its operation.

A copy of this bulletin may be obtained by entering the above key number on a Reader Service Card.

645
CONCRETE IMPROVER

American Bitumuls Co., 200 Bush St., San Francisco 4, Calif., has recently issued a bulletin on **Hydropel,** which is a material that improves concrete. The addition of a small percentage of this material to concrete mix will reduce capillary absorption, resist the action of alkaline or neutral salts, eliminate internal stresses, cushion impact resistance, preserve the natural strength of concrete, add warmth and resilience to ground floor slabs, avoid segregation and improve workability, and strengthen and resist moisture in cement base materials.

The booklet describes what Hydropel is, its development, gives its characteristics as to impermeability, expansion and contraction, chemical resistance, impact resistance, warmth and resilience, workability, and bonding strength. The bulletin also tells of the many uses for Hydropel in concrete, mortar, and gives the procedure for mixing, curing, and testing.

Information in this bulletin should be of interest to any water and sewage works manager or engineer planning concrete construction.

For a copy of this booklet, enter your name and the above key number on a Reader Service Card and mail.

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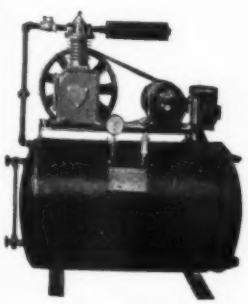
646
ANTI-RUST PAINT

Speco, Inc., 3142 Superior Ave., Cleveland, Ohio, has published a new booklet on **Rustrem,** an anti-rust paint. The booklet contains complete directions for application and discusses the various uses of the material.

Rustrem is available in black or aluminum.

Copies of the bulletin can be obtained by mailing a Reader Service card with the above key number.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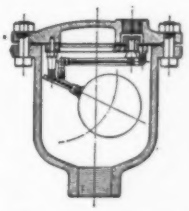
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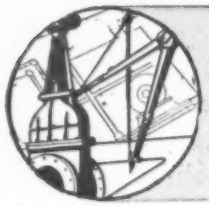

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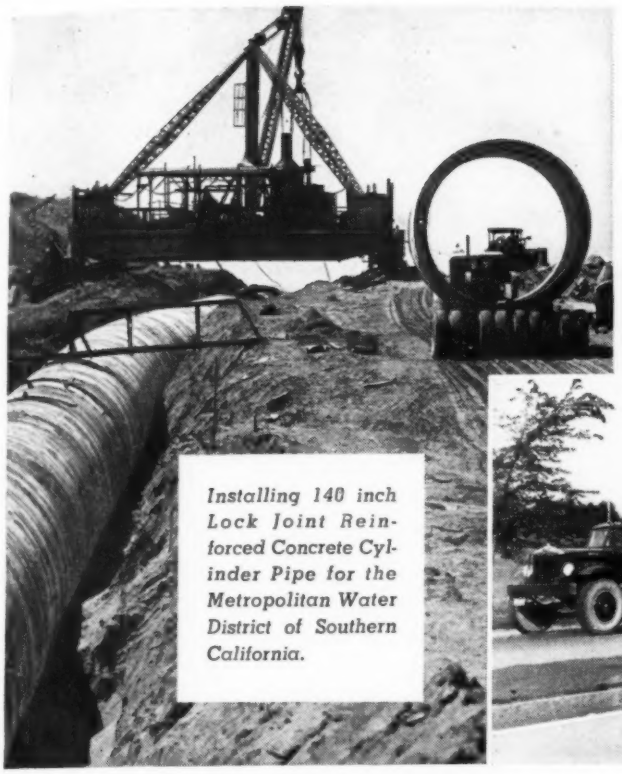

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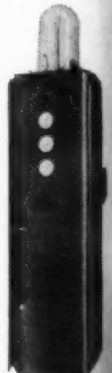
This experience at Little Rock is representative of the multiple protection that you can obtain with the Break-Point Process. For complete details on other Break-Point benefits such as longer filter runs and iron and manganese removal, see your nearest W&T Representative.



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